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[OFFICIAL NOTICE.]

Annual Meeting, American Gas Institute.

HEADQUARTERS, AMERICAN GAS INSTITUTE,
29 West 39th St., New York City,
August 17th, 1910.

The Annual Meeting of the American Gas Institute will be held at Headquarters, 29 West 39th street, New York, beginning Wednesday, October 19th.

Hotel headquarters will be at Hotel Astor, Times Square.

It is important to engage rooms early.

The Committee on Arrangements has not entirely completed its programme, but has plans for a banquet Thursday evening, at the Hotel Astor, a theater party on Wednesday evening, for members and accompanying ladies, and a steamer excursion on Friday.

Special rates are being arranged by the Trunk Line and other Railway Associations, details of which will be announced later.

It is planned to have a morning and afternoon session, Wednesday and Thursday, with lunch served in the Engineering Societies Building, between sessions, and to devote Friday to the excursion.

The Technical Committee announces that it has 16 very interesting papers to be presented, covering technical, commercial and general subjects.

Further announcement in relation to subjects of papers and details of meeting, will be made later. A. B. BEADLE, Secretary.

[Special Editorial Correspondence, by Telegraph.]

EIGHTEENTH ANNUAL CONVENTION, PACIFIC COAST GAS ASSOCIATION.

LOS ANGELES, CAL., Sept. 20, 1910.

Dear JOURNAL: The 18th Convention of the Pacific Coast Gas Association was convened in Los Angeles, by President W. B. Cline, according to programme, at 10 A.M. of the date of these despatches. Not a hitch halted the progress of the first day's deliberations, which were carried on amidst conditions well qualified to carry the proceedings with vim, vigor and variety. The weather was good enough for anybody, the attendance (over 150 the first day) was excellent, the housings, both as to meeting room and headquarters, were everything that even an exacting one could wish. Our well-loved President kept things going smoothly, in which respect he was ably assisted by Asst. Sec. Bostwick, whose capacity for detail is really remarkable. The business was carried on in smooth fashion, and it came so fast that I will only summarize it for pith, otherwise this message would string out in many lengthy paragraphs. The Directors' meeting last night was notable particularly for a recommendation (subsequently indorsed, as indeed were all the presentments of the Board) that a special committee be appointed to revise the Constitution and By-laws regulating especially the articles governing the manner of admitting new members and assigning them to the proper grades. Another noteworthy thing in this respect was the admission to membership of 61 in the active class and 17 in the associate grade. Regarding the presence of noteworthy men at the meeting there were several, but towering above them all was "Fred." Egner, whose features, as time treats them, cause him to look more and more like an idealized religionist than a gas engineer of fame and honor. As to the fair sex; well, they are here in goodly numbers, all, to the very last girl, seemingly enjoying completely all the attentions showered upon them by the local committee. President Cline's masterful address was mainly along historical lines, but these were referred to only that comparison respecting progress in the industry could be freely made. The paper list, with 17 separate numbers, amply bore out its fruitful promise, and perhaps the 3 respectively by Messrs. Jas. M. Barkley, H. W. Burkhart and P. W. Prutzman, in that the two dealt with oil gas from 3 points of view, got the greatest share. In fact the Burkhart story was the signal for a notable discussion, since in it he reported the fact of the recent tap-

ping of a natural gas deposit close to Los Angeles, that was yielding a daily output of 40 millions cubic feet. This talk was more than noteworthy from the part taken therein by the senior Britton, who recalled to his hearers the fact that Edison, in 1879, natural gas in the Central and Middle West States in the double decade from 1880, and various other "shocks" had been safely weathered by the gas men, wherefore the Coast need not fear that artificial gas would still be in the field when natural gas was a thing of the past—more's the pity. I will not attempt to go over the papers in detail. Suffice it to say they were of a high order and will bear close reading when the JOURNAL reprints them. Editor Schade's parchment of "Wrinkles," and the recounting of "Experiences," by Editor Jones (he surely is the son of his father), completed a technical part that verily was enjoyed. The contest for next place of meeting resulted in the selection of Oakland, and the officers elected were:

President—F. A. Leach, Oakland.
Vice-President—Wm. Baurhyte, Los Angeles.
Sec. and Treas.—John A. Britton, San Francisco.
Asst. Sec.—Henry Bostwick, San Francisco.
Directors—H. E. Adams, H. T. Burkhart, E. C. Jones and J. M. Berkley.
Wrinkle Editor—F. C. Willard.
Experience Editor—John D. Kuster.
Novelty Editor—John Clement.
Librarian—Ed. C. Jones.
Advisory Board—Sherwood Grover and F. Foveaux.
On Engineers' Degree—J. A. Britton, E. C. Jones and L. P. Lowe.

In connection with the meeting proper there is being held a "subsidiary" gathering, which consists of displays by 25 different companies or individuals concerned in the manufacture and sale of gas appliances. While all of the exhibits are meritorious and attractive, if one may judge through or by those attracting the greatest attention, these by the Mueller Manufacturing Company, of Decatur, Ills., and by the Welsbach Company, are well in the lead. I will not attempt (knowing that your pressman will be howling for "forms" by noon of Friday) to go into the attractive features of the entertainment that has been and is to be provided. Our hosts on Thursday were the members of the Southern California Edison Company; to-morrow (Friday) we will be in the generous hands of the local Domestic Gas Company, and Saturday we are to share in a glorious programme arranged by the Los Angeles Gas and Electric Corporation. Better by far to have one of the survivors narrate at a later date the times which were enjoyed on every second of these times of unboundless, hearty hospitality.—B.-B.

BRIEFLY TOLD.

REPORT OF SUB-COMMITTEE OF JOINT COMMITTEE OF NINE, REPRESENTING THE NEW YORK PUBLIC SERVICE COMMISSION, SECOND DISTRICT, RESPECTING CALORIMETRY.—In response to a preliminary inquiry over the divising of a standard method for determining the heating value of a gas supplied in this State, Mr. Charles H. Stone, Chief Inspector of Gas, instituted an examination which led to a certain series of determinations, these being embodied in a report to the Commission, by Mr. H. C. Hazard, Division Chief. The report bore date of October 29, 1909. In December (8, 1909) the Commission addressed a general letter to the gas companies in the State asking these to send representatives to a conference, set for February 1, 1910, the Capitol, Albany, being designated as the place for conference. The conferrees were then named as follows: On behalf of the Commission: Messrs. H. C. Hazard, H. H. Crowell and Chas. H. Stone. On behalf of the Companies: Messrs. R. M. Searle, W. R. Addicks, W. R. Beal, J. C. De Long, W. T. Morris and M. W. Offutt. This Joint Committee, having chosen Mr. Hazard as Chairman, named Messrs. W. R. Addicks, Jas. C. De Long and C. H. Stone a sub-Committee to report a method or methods for formulating a standard way and means of determining the calorific value of gases. The sub-Committee in due time handed in its determinations, which were considered and adopted by the joint-Committee, March 11, 1910. Some revision was further made May 6th, 1910, at which date the findings were ordered printed for those participating in the inquiry. We have from time to time published several of these findings, and all that remains really is to print the first, second and third sections of the document—which has to commend it clearness, completeness and accuracy; but as these have been published by the Empire State Gas and Electric Association in pamphlet form (a copy of this has been sent to all the companies concerned), and as the Association, to merely recoup itself, proposes to charge 50 cents for each extra copy furnished, we will not reprint the unpublished sections at this time. We will lead the subscription by ordering 3 copies for our own use. The address for copies to be mailed from is: Empire State Gas and Electric Association, Chas. H. B. Chapin, Secretary, No. 29 West 39th street, New York city.

CURRENT MENTION—

ON Thursday last the New York Public Service Commission, First District, affirmed an agreement, and issued an order in consonance therewith, declaring that the selling rate for gas in the Bay Ridge district (Wards 30 and 31 Brooklyn Borough) of New York city shall be adjusted to a sliding scale, the minimum rate in which shall eventually be 80 cents per 1,000 cubic feet, or equal to the rate at present charged in the boroughs of Manhattan and Brooklyn. The rate heretofore was $1 per 1,000.

THE authorities of Lebanon, O., have under consideration the matter of taking over the local gas plant for operation on municipal account. The prime mover in the instance is Attorney Francis Brandon.

"THE new water gas plant of the Amherst (Mass) Company, which was put in duty early this month, is giving good satisfaction." So writes "A. L. F.," who adds: "The plant is large enough to serve a community many times larger than Amherst, so that it will be sufficient to supply all demands for many years to come. The reduction of the price from $4 per 1,000 cubic feet to $1.80 has induced builders of apartment houses to substitute gas stoves for coal ranges, and many housekeepers are putting them into their kitchens."

THE authorities of Fall River, Mass., have determined to discontinue all "fluid lights," which form any part of the public lighting outfit, wherever such lighted sections are reached by gas mains or electric current carrying wires. Under this determination 415 boulevard mantle gas lamps and 101 boulevard electric lights will be put in service, at the respective rates of $25 and $22 each. It is also proposed to cause the contract term to be lengthened to a period of 3 years.

AT a meeting of the Directors of the Kansas City (Mo.) Gas Company it was voted to set apart an appropriation amounting to $400,000, for the construction of an emergency gasholder, to be located at 20th street and Indiana avenue. This holder is to be used in connection with the natural gas supply.

AN ordinance which has for its object the granting of a franchise for construction and operation of a gas plant in Daytona, Fla., is under consideration by the authorities. Homer J. Smith, of Camden, Del., who is also interested in the Gas Light and Power Producing Company, of Cleveland, O., is the sponsor of those interested in the movement, and the ordinance asks for an exclusive charter, to run for 25 years, the selling rate to be $1.25 per 1,000, this to last until the annual output of the concern shall exceed 30,000,000 cubic feet. Thereafter the rate is to rule at $1 per 1,000. The franchise will, in case it receives the Mayor's signature, have to be passed on by a vote of the houseowners, and it is suggested that the 18th prox. will be a suitable one on which to have such vote taken. Our informant in this instance advises that the Smith contingent propose to manufacture a gas from crude oil, as produced according to the formula known as the Darling process.

THE City Council of White Hall, Ills., has affirmed the petition of A. E. Dunn and associates, of East St. Louis, Ills., for the right to there construct and operate a gas plant. The grant is to run for 30 years.

AN odd cause for action for damages will be offered for the consideration of Judge Rose, of the United States Circuit Court, who will sit in Cumberland, Md., to-morrow. The case is that of F. J. Close, a railway trainman in the employ of the Maryland Railway Company, against the West Virginia and Maryland Natural Gas Company, for injuries sustained by him in an explosion of gas in the Railroad Company's yards, opposite Cumberland. A gas main of defendant sprung a leak, and as the engine on which Close was riding passed the point of leakage, a blaze burst from the firebox, causing the gas to explode, Close being badly burned as a result thereof.

THE Eastern Light and Fuel Company, which controls the gas supply of Glassboro, Pitman, etc., has awarded a contract to the Stacey Company, of Cincinnati, O., under which the latter will erect a complete new water gas plant (2 sets), the necessary purifying apparatus, and a storage holder up to retaining 1,000,000 cubic feet. The growth of the Pitman-Glassboro section in respect of a gas supply is nothing short of amazing. The Company there, if we mistake not, has been in operation something less than two years, and at the start it was conceded that a holder up to retaining 100,000 cubic feet would be ample for 10 years or more!

A History of the Massachusetts Board of Gas and Electric Light Commissioners.

"Practical Politics," in giving an historical resume of the Massachusetts Board of Gas and Electric Light Commissioners, remarks that, 25 years ago last summer, Massachusetts established her Gas and Electric Light Commission, appointed originally under special act of the Legislature by Governor George D. Robinson, a Board with a reputation extending to-day far beyond the confines of the Commonwealth, its rulings and decisions being cited, not only in this country, but even across the seas in ancient London and mother England. Its Chairman, Forrest E. Barker, of Worcester, has faithfully served the State and the consumer throughout the entire period, first as a member of the original Commission and for the last 16 years as Chairman.

The first Gas Company in Massachusetts, the Boston Gas Light Company, was instituted in 1823, and of the 61 Companies in existence in 1885, at the time the Gas Commission entered upon its duties, 35 were chartered under special acts between the years 1845 and 1855, the general law for the organization of Gas Companies by 10 or more persons being enacted in the latter year. These Companies continued to be formed until J. Edward Addicks came into the public eye in this State and Bay State gas first took prominence in the Massachusetts field. That Company was organized February 16, 1885, and its advent was quickly followed by the enactment, by the Legislature of the same year, of the law creating a Gas and Electric Light Commission, approved by the Governor, June 11. The original members of the Board—Forrest E. Barker, of Worcester, Edward T. Rowell, of Lowell, and Starkes Whiton, of Hingham—were appointed for 1, 2 and 3 years respectively, and confirmed July 16. The full term of office by the provision of the act was 3 years. This Board began the discharge of its duties, August 1, 1885. Of its original members Mr. Barker, as stated, alone continues.

Electricity was first introduced in Massachusetts for lighting purposes about the year 1880. By 1887 there were 48 Companies organized for the distribution of electricity for light, heat and power. Twenty years later their number was increased to 146, of which 50 were engaged in the supply of both gas and electricity and 22 municipalities were conducting their own plants. There are now more than 150 electric light companies.

The powers granted by the General Court to the Gas and Electric Light Commission give to the Board the general supervision of all this great field. It is the only Commission in this State that has the power to fix a rate. Every Company engaged in the manufacture and sale of gas or electricity for light, heat or power, is directly under its restrictive control. The Commissioners are required to ascertain the degree of purity of the gas manufactured and to fix a standard for the same, to which they may compel the Companies to rigidly adhere. They may make their own regulations which the various corporations and municipalities operating their own plants must live up to.

In case of any refusal or neglect to comply with those regulations it is obligatory upon the Commission to report to the Attorney-General any corporation or company which violates or neglects to comply with the statute which gives to the regulations of the Gas Commission the force of law. The Commissioners are also required to report annually to the Legislature the names of all Companies in Massachusetts engaged in the manufacture and distribution of gas and electricity, a statement of their condition and business and such recommendations in regard to gas and electric light legislation as the Board may consider necessary.

They may authorize a gas company to engage in the business of generating gas, electricity and heat. Publicity is one of the most important requirements of the Massachusetts policy of supervision and regulating the business of supplying gas and electricity, and in conforming with that policy the Gas and Electric Light Commission holds public hearings and publicly investigates all complaints against gas and electric companies as to the amount furnished, the price charged and the quality.

The questions that the Board have to deal with are fundamental and have covered the ground which other commissions, both National and State, are now entering upon for the determination of the relations of the corporations to the public. In 1894 certain anti-stock watering laws were enacted, limiting all issues of stocks and bonds to such amounts as the Gas and Electric Light Commission shall deem requisite. Not only does the Board do this, but it also fixes the price at which new issues of stock shall be sold by the companies.

In its dealings with them the Massachusetts Commission has had some momentous cases in which it has had to safeguard the public interest and the consumer against the rapacity of the capitalist. When J. Edward Addicks came to Boston, with his Bay State Gas project, there followed the great struggle over the reduction in the price of gas furnished the people which resulted finally in reducing it to $1 to the consumer.

The struggle went on with Addicks until Rogers entered the field with the Brookline Gas Company and then, when they gave way to Whitney and the Massachusetts Pipe Line Company, another big phase of the gas situation in this Commonwealth presented itself and the contest went on with the Commission steadfastly adhering to the policy of the Commonwealth and refusing to be swerved from it no matter how powerful the interest arrayed against it in influence or capital.

With the coming of the New England Gas and Coke Company still another serious phase was put upon the gas situation in Massachusetts which the Commission had to face and meet, which it did courageously and firmly. With the disruption of that scheme the whole situation fell into the hands of the Massachusetts Gas Companies Association and then came the struggle for a recapitalization of all of the interests which involved a great many millions of dollars and ended in the capitalization being kept down and the sliding scale established.

The Boston Consolidated Gas Company has published an itemized balance sheet of its assets and liabilities since 1886, and in 1906 came the sliding scale. Prior to that Morgan attempted a consolidation of the electric light companies which the Massachusetts Gas and Electric Light Commission was instrumental in heading off; forcing the consolidation of the companies on an equitable basis.

Now an additional field has been added to that hitherto covered by the Gas and Electric Light Commission, and that is the smoke nuisance, which, under the act of 1910, has been placed under the jurisdiction of the Board. It is going ahead with its accustomed energy and diligence, and will, as soon as the Civil Service Commission supplies it, put on inspectors to thoroughly investigate the situation.

Massachusetts has been fortunate in the high personnel of its Gas and Electric Light Commission. Probably no other man in the country has had so long and varied experience in the gas and electric light field as has had Chairman Forrest E. Barker. He is 57 years of age and still in the prime of his activities. Born in Exeter, September 29, 1853, he was graduated at Wesleyan University in 1874, and took a course in the Boston University law school, locating for his practice at the bar in Worcester, from which city he was chosen to the Massachusetts house in 1883 and 1884.

Those were in the memorable days of Butler and Robinson when the race for the governorship was hot. Upon the accession of the lawyer from Chicopee he picked Mr. Barker for the new Gas Commission, and results have shown that the Governor judged well his man for the position which he has filled with so great acceptance for a quarter of a century. For 9 years Commissioner Barker served faithfully as a member, until in 1894 he was made Chairman of the Board upon which he had achieved an enviable reputation. In that year he went to Europe, studying there everything pertaining to the making of gas and electricity in England and the great cities of the Continent. In 1896 he again crossed the water by order of the General Court to continue his studies on the municipal lighting problems in Europe and to learn wherein our methods in Massachusetts could be improved. It is doubtful if another could be found possessed of such a vast store of information regarding the gas situation in the old and the new world.

He has demonstrated that he is a perfect walking compendium as to everything and anything pertaining to the subject with which he has to deal. Coming back to Boston he has applied his knowledge to the many and varied problems presented to him as Chairman of one of the most important Boards in the Commonwealth and it is to his powers of intuition and his keen analysis very largely that the reputation which our Gas and Electric Light Commission has achieved in other States and abroad is due. Mr. Barker attained high rank in his collegiate days as a student. He is a member of Phi Beta Kappa and a member of the Masonic fraternity of the highest degree, a life member of the Grand Council of the United States and all other grand bodies except the Grand Commandery, K. T.

Gen. Morris Schaff, next in seniority of service, was appointed, from Pittsfield, by Gov. William E. Russell, July 3, 1893, to succeed Chas. A. Towne, of Orange, and thus has entered upon his 18th year of service in handling gas questions. He has contributed in very great degree to the standing which the Massachusetts Board has obtained among kindred commissions of the State. Of inflexible honesty

of intent and purpose the General has been a keen investigator and has shown a great ability in digging beneath the surface and laying bare the roots of a proposition coming before the Board for its consideration. He is one of the most plain spoken members of the Commission, naturally, for by early training he was a soldier and obtained his education at the military academy of the United States at West Point, from which he graduated when the civil war was on and the nation needed soldiers to command. Born in Licking county, Ohio, in 1840, the General entered West Point at 18, and graduated 4 years later, to take the field at once as a Lieutenant of Ordnance. It was in the field artillery that he won his spurs. Brevetted a Captain on the field for gallantry in the battle of the Wilderness he was commissioned full Captain in 1867. Promotions were slow in the regular service after the civil war and Gen. Schaff resigned to enter civil life. He served on the staff of Gov. Long and was Inspector General of militia with the rank of Brigadier General from 1881 to 1883. He was also a member of the State Board of Health prior to going upon the Gas Commission to which he has since devoted his energies and powers, rendering loyal and able service.

Alonzo R. Weed, the third and youngest member, was appointed by Gov. Guild, July 6, 1906, to succeed Samuel George, of Haverhill. He is a native and resident of Newton, of which city he was Mayor in 1904 and '05. He by his personal efforts secured the reduction of 15 cents per 1,000 on the price of gas in Newton, and he also worked indefatigably until he obtained the legislation which obliged the electric light companies to bury their wires underground in the city streets. Mr. Weed owed his selection by Gov. Guild for Gas Commissioner not only to his native ability and the desire of the Governor to infuse new blood into the Board, as he stated, but because of the attitude of Commissioner George on the sliding scale, a bill which the Governor had but recently signed at the time. Mr. Weed brought to his new position the skill and acumen of a successful lawyer of a modern school. He has worked harmoniously with his associates on the Board and has fitted into his place as though made for it. Commissioner Weed is a native of Newton, where he resides.

Constants and Variables in the Destructive Distillation of Coal.

[Prepared by Prof. Alfred H. White and Mr. B. M. Ferguson, for the Nineteenth Meeting, Michigan Gas Association.]

Introduction.—The present paper is the tenth to be presented to the Michigan Gas Association, as a result of your support of a fellowship in gas engineering at the University of Michigan. The paper presented last year gave a description of the experimental station for gas manufacture and of the method of conducting tests. The general scheme of the experimental plant has not been altered since the description a year ago, but details of arrangement have been greatly changed. The building has been enlarged to double its former size, and the apparatus rearranged so as to be more accessible and more readily controlled. The same retort has been used throughout the two years of the tests. The most important addition to the equipment has been a Lloyd control, for constant retort pressure, a gift from the Lloyd Construction Company, which we gratefully acknowledge. It was installed too late to be used in the work reported here. The technologic branch of the U. S. Geological Survey has co-operated in the work by making chemical analyses and determining heat value of the coals and cokes used in the tests, as it did last year.

The paper presented last year[1] reported 18 tests on 11 different coals of widely different composition from all sections of the United States. It was recognized that it was unsafe to draw conclusions from so few tests, and the paper was almost entirely descriptive.

The work of the present year has been an extension of that of last year, but it has been confined to a smaller number of coals, and an attempt has been made to determine the effect of variables in operating conditions. The samples of coal were portions of the identical lots used last year. Most of them had been stored in sacks under cover, but two of them had been stored in open bins exposed to the weather. This effect of weathering furnished one variable to be studied. Another variable was introduced by substituting for the 400-pound charge, uniformly used last year, charges of 300, 400, 500 and even 600 pounds. These were the only two variables purposely introduced, but the retort temperature was unavoidably a variable; and, as will be shown later, so was the pressure on the retort. The results of the tests failed to show any definite effect due to weathering. This is an important question, and it is planned to inaugurate during the coming year a weathering test which shall extend over a period of 5 years.

Presentation of Data.—The five coals on which report is made come from the States of Illinois, Kentucky, Pennsylvania, Tennessee and West Virginia. At least one test on each of the coals, except those from West Virginia, was reported last year. There were then presented full data and curves showing the composition of the coals and the changes taking place during distillation.

The curves obtained this year were similar to those of last year, and are omitted from this report. There are here presented summarized data showing the average composition of each coal and the data of the tests which are used in the discussions. Tests 18 to 35 belong in last year's series, those with higher numbers in this year's. There is also presented a more detailed discussion and representation of the tests on an individual coal to serve as an introduction. The coal chosen is that from Hellier, Kentucky, the tests of which afford a wide range of conditions.

Coal from Hellier, Kentucky.—A carload of this coal (U. S. G., No. A. A. 3) was received in January, 1909, and a portion of it was stored in a bin exposed to the weather. Five tests were made on it, two on charges of 400 pounds, and one each on a charge of 500, 360 and 300 pounds. Tests 21 and 30 were made in the spring of 1909. Tests 54, 55 and 56 were made consecutively in one day on the same coal a year later, it having been exposed all that time to the weather. Tests 21 and 30 were made in a retort heated to over 2,000° F., while the other three were distilled at about 1,850°. There were thus many variables which might affect the results. Condensed data are given in Table I., and a graphic representation of the changes in quality and quantity of gas evolved is given in Plate I. The average result of the five tests is as follows:

Materials.	Quantities.
Coke, per cent	63.9
Gas, cubic feet per pound coal	5.05
Candle power	14.7
Candle feet	74.4
B. T. U., per cubic foot of gas	642.0
B. T. U., in gas from 1 pound of coal	3,261.0
NH_3, pounds per ton coal	4.17
Tar, gallons per ton coal	11.2

The figures of Table I. show a great lack of uniformity. The yield of gas per pound of coal varies from 4.72 to 5.29. Eliminating the ash and moisture and calculating the weight of coal to a moisture and ash free basis, do not bring the figures into much closer agreement, the variation being 5.13 to 5.60 cubic feet. The yield is not apparently a function of temperature nor of the weight of charge. The question will be taken up later, but the variation may be considered provisionally as due to some unknown cause.

The candle power of the gas varies from 14.1 to 15.5, and the candle feet from 69.9 to 78.9 without any adequate explanation being apparent. The heating value of the gas is only slightly more constant, varying from 622 to 662 B. T. U. per cubic foot. The number of heat units in the gas derived from 1 pound of coal varies from 3,110 to 3,320. There is an apparent relation between this value and the retort temperature—a point which will be taken up more fully later. The yield of NH_3 per ton coal varies from 4.02 to 4.44 pounds with no evident explanation.

The curves of Plate I. indicate a much greater uniformity. The curves of candle power and heat value decrease with reasonable regularity and the gas yield is regular. The curves are introduced mainly to show these points which are characteristic of all the tests on all the coals, the results on which the various tests agree rather than those on which they differ. Particular attention is drawn to the evenness of the quantity of gas evolved from a retort during ½ hour, independent of the weight of the coal contained in it. Attention is also directed to the corresponding set of curves showing rate gas evolution per ½ hour, referred to a ton of coal as a basis. This last series of curves shows a systematic difference with weight of charge. They are characteristic of the tests on the other coals which are not as fully set forth. These points are taken up more fully further on in the paper.

Coal from Harrisburg, Ills.—This coal (U. S. G., No. A. A., 13) was from Harrisburg, Saline county, Ills., and was given one test (No. 35) last year under very favorable conditions, the interior of the retort being badly coated with carbon and its temperature very low. Three tests on charges of 500, 400 and 300 pounds each, made con-

[1] Studies in the Manufacture of Coal Gas (second paper), by Alfred H. White, John H. Wyman, William A. Dunkley and Perry Barker. Proceedings, Michigan Gas Association, 1909.

secutively, were added this year. The average composition of the coal used for the various tests, and the condensed data for each test, are given in Table II. The average result of all the tests is given below:

Materials.	Quantities.
Coke, per cent	62 2
Gas, cubic feet per pound coal	14.5
Candle power	15.2
Candle feet	69.5
B. T. U. per cubic foot of gas	618.0
B. T. U. in gas from 1 pound of coal	2,862.0
NH_3 pounds per ton of coal	5.54
Tar, gallons per ton coal	14.5

been weathered 2 winters was used for the consecutive tests 43, 44 and 45, the charges being 500, 400 and 300 pounds respectively. The average result of the 7 tests is as follows:

Materials.	Quantities.
Coke, per cent	67.1
Gas, cubic feet per pound coal	5.12
Candle power	15.2
Candle feet	77.9
B. T. U. per cubic foot of gas	626.0
B. T. U. in gas from 1 pound of coal	3,208.0
NH_3 pounds per ton coal	5.0
Tar, gallons per ton coal	14.5

TABLE I.—*Data of Tests on Coal AA3 From Hellier, Kentucky.*

Data on Tests.	Test No. 21.	Test No. 30.	Test No. 54.	Test No. 55.	Test No. 56.
Coal charged, pounds	360[1]	400	500[2]	400[2]	300[2]
Average temperature, exterior of retort, degs. F	2,236	2,020	1,864	1,841	1,851
Yields per pound coal as charged—					
Gas, cubic feet corrected	4.72	5.00	5.29	5.17	5.09
Candle power, average	14.5	14.1	14.2	15.3	15.5
Candle feet	69.7	70.5	75.2	77.6	78.9
B. T. U. per cubic feet, gross	650.0	622.0	630.0	649.0	662.0
Total B. T. U. in gas from 1 pound coal	3,126.0	3,110.0	3,340.0	3,360.0	3,370.0
Yields per pound coal, M. & A. free—					
Gas, cubic feet corrected	5.15	5.39	5.60	5.47	5.37
Candle feet	74.7	76.0	79.5	83.9	83.4
Total B. T. U. in gas per pound, coal M. & A. free	3,340.0	3,350.0	3,530.0	3,550.0	3,560.0
NH_3 pounds per ton coal, as charged	4.02	4.07	4.25	4.44	4.80
NH_3 pounds per ton coal, M. & A. free	4.39	4.25	4.49	4.70	4.32
Yields per hour—					
Duration of carbonization, hours	4.08	4.50	5.92	4.33	3.42
Total cubic feet of gas from charge	1,696.0	2,003.0	2,646.0	2,067.0[3]	1,524.0
Average cubic feet gas per hour from charge	416.0[1]	451.0	447.0	477.0	446.0
" " " " " pound coal per hour	1.15	1.13	0.89	1.19	1.49
" " " " " " coal, M. & A. free, per hour	1.27	1.20	0.95	1.24	1.57
Weight balance—products per cent. by weight—					
Coke	69.4	64.5	66.0	62.0	57.7
Gas	15.9	15.0	15.8	15.7	15.8
Tar	4.9	8.3	4.5	4.5	4.5
Ammonia liquor	4.4	5.9	6.7	7.7	7.2
Unaccounted-for	5.4	6.3	7.0	10.0	14.9

Average Composition of Coal.	As Charged.	Moisture Free.	Moisture and Ash Free
Moisture	2.45	....	....
Volatile	33.31	34.40	35.55
Fixed carbon	60.29	61 80	64.45
Ash	3.95	4.06	....
Sulphur	0.54	0.55	0.57
Calorific value, B. T. U.	14,312.00	14,680.00	15,290.00

1. Ret rt badly coated with carbon.
2. Coal had been weathered 18 months but was approximately air-dry when charged.
3. The meter readings for 10 minutes of this test are interpolated.

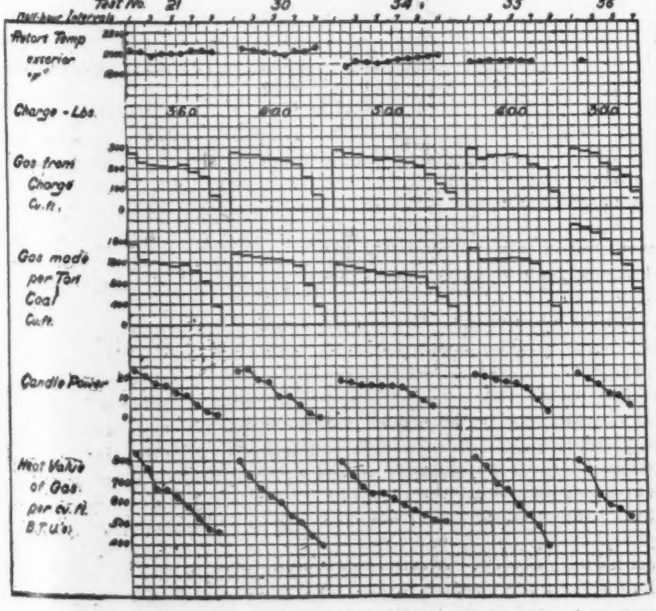

PLATE I.

Typical Curves Showing Amount and Quality of Gas Evolved from a Charge of Coal in Successive Half-hour Intervals.

Coal from Scott Haven, Pa.—A carload of this Pittsburgh coal (U. S. G., No. A. A. 1) was received in October, 1909. It was used in tests 18, 19, 20 and 32 reported last year. A portion of which had

The condensed data for the various tests forms Table III., which also gives the average composition of the coal. It is not safe to ascribe any of the changes in results to weathering.

Coal from LaFolette, Tenn.—This coal, from Rex No. 2 mine, LaFollette, Campbell county, Tenn (U. S. G., No. A. A. 10), was used for test No. 31 of last year. It was given a series of three consecutive tests this year on charges of 298, 400 and 500 pounds. It yields a large amount of gas of good candle power and heat value, but gives a poor grade of coke which is physically weak. The average result of the four tests is as follows:

Materials.	Quantities.
Coke, per cent.	64.5
Gas, cubic feet per pound coal	5.51
Candle power	15.7
Candle feet	85.1
B.T.U. per cubic foot of gas	645.0
B.T.U. in gas from 1 pound of coal	3,555.0
NH_3 pounds per ton coal	6.42
Tar, gallons per ton coal	17.3

Table IV. gives the data of the individual tests and also the average composition of the coal.

Coals from Monangah and Holden, W. Va.—Two West Virginia coals were tested this year, which were so closely alike in chemical composition that they are here treated together, and indeed were actually mixed together on two tests, when there was an insufficient amount of either one alone for the purpose. The coal from Monangah, Marion county, (U. S. G. No. A. A. 14) was only given one successful test. The coal from Holden, Logan county (U. S. G. No. A. A. 13), was used on two successful tests. It is worth recording that the only genuine naphthaline trouble which the experimental plant has ever encountered came while running a test on a 300-pound charge of this coal. The trouble was serious enough to make it necessary to discard the results of the test. These two coals were also used, mixed in approximately equal amount, to secure material for two consecutive tests on charges of 600 and 500 pounds. It is hardly fair to average these tests, but the data of each test will be found in Table V., where also is given the composition of the coals.

Rate of Evolution of Gas from one Retort.—One of the striking facts shown by the curves of the five tests on the Hellier coal is the uniformity of the rate at which the gas is evolved from the retort, irrespective of the size of the charge of coal and the temperature of the retort. When conducting an experiment, meter readings are taken every 5 minutes, and the test is stopped when the rate of pro-

TABLE II.—*Data of Tests on Coal AA12, from Harrisburgh, Ills.*

Data on Tests.	Test No. 35.	Test No. 46.	Test No. 47.	Test No. 48.
Coal charged, pounds	400.00	500.00	400.00	300.00
Average temperature, exterior of retort, degs. F.	1,777.00	1,979.00	1,954.00	1,819.00
Yields per pound coal charged—				
Gas, cubic feet corrected	4.4	4.59	4.70	4.83
Candle power, average	15.2	15.3	15.8	14.4
Candle feet	65.3	68.8	74.3	69.7
B.T.U. per cubic foot gross	632.0	623.0	608.0	611.0
Total B.T.U. in gas from 1 pound coal	2,780.0	2,860.0	2,860.0	2,950.0
Yields per pound coal, M & A free—				
Gas, cubic feet corrected	4.94	5.07	5.30	5.45
Candle feet	75.1	77.6	83.8	78.5
Total B.T.U. in gas per pound coal, M & A free	3,120.00	3,160.00	3,220.00	3,330.00
NH, pounds per ton coal as charged	6.38	4.90	5.23	5.66
NH, pounds per ton coal, M & A free	7.20	5.52	5.90	6.31
Yields per hour—				
Duration of carbonization, hours	4.67	5.08	4.58	3.50
Total cubic feet of gas from charge	1,741.00	2,248.00	1,880.00	1,448.00
Average cubic feet gas per hour from charge	373.00	444.00	412.00	415.00
Average cubic feet gas per pound coal per hour	0.93	0.89	1.03	1.38
Average cubic feet gas per pound coal, M & A free, per hour	1.05	1.00	1.16	1.56
Weight balance—products by weight—				
Coke	62.3	63.00	62.5	61.0
Gas	14.3	14.00	14.6	15.2
Tar	8.6	7.5	6.5	6.7
Ammonia liquor	6.8	7.7	7.6	8.1
Unaccounted for	8 0	7.8	8.8	8.9

Average Composition of Coal.	As Charged.	Moisture Free.	Moisture and Ash Free.
Moisture	4.64	....	....
Volatile	35.62	37.38	40.10
Fixed carbon	53.08	55.73	59.90
Ash	6.66	6 89	....
Sulphur	1.78	1.85	2.01
Calorific value, B.T.U.	13,011.00	13,510.00	14,510.00

months, under whatever retort conditions happened to be present on the day of the test, show a mean rate of 441 cubic feet of gas per hour, with a maximum variation of 7.5 per cent. The conspicuously low figure of test 19 may be accounted for by the memorandum in the log that the retort was badly coated with carbon, while the high figure of test 20 may be explained by the memorandum that the retort had been recently decarbonized and was free from carbon. If these two tests are omitted from the average, the greatest variation from the mean of the five tests, including three 400, one 500 and one 300-pound charge, becomes 2 per cent. on an average of 443 cubic feet per hour.

TABLE III.—*Data of Tests on Coal AA1 from Scott Haven, Pa.*

Data on Tests.	Test No. 18.	Test No. 19.[1]	Test No. 20.[2]	Test No. 32.	Test No. 43.	Test No. 44.[3]	Test No. 45.[3]
Coal charged, pounds	404.00	400.00	400.00	400.00	500.00	400.00	300.00
Average temperature, exterior of retort, degs. F.	1,994.00	1,925.00	1,922.00	1,844.00	....	....	....
Yield per pound coal as charged—							
Gas, cubic feet corrected	4.84	4.93	5.27	5.14	5.22	5.15	5.26
Candle power, average	14.3	15.2	16.00	15.4	15.00	16.3	14.3
Candle feet	69.3	75.0	84.3	79.2	78.3	84.00	75.3
B.T.U. per cubic foot gross	602.0	649.0	611.00	664.00	614.00	635.00	610.00
Total B.T.U. in gas from 1 pound coal	2,940.0	3,200.0	3,230.00	3,410.00	3,200.00	3,265.00	3,210.00
Yields per pound coal, M & A free—							
Gas, cubic feet corrected	5.28	5.34	5.79	5.56	5.68	5.61	5.75
Candle feet	75.5	81.2	92.6	85.8	85.2	91.6	82.3
Total B.T.U. in gas per pound coal, M & A free	3,180.0	3,460.00	3,540.00	3,690.00	3,480.00	3,560.00	3,510.00
NH, pounds per ton coal as charged	....	5.79	5.17	5.32	4.56	4.30	4.88
NH, pounds per ton coal, M & A free	....	6.43	5.67	5.75	4.97	4.69	5.31
Yields per hour—							
Duration of carbonization, hours	4.48	4.83	4.55	4.70	5.83	4.67	3.50
Total cubic feet of gas from charge	1,952.00	1,974.00	2,110.00	2,055.00	2,606.00	2,060.00	1,578.00
Average cubic feet gas per hour from charge	436.00	408.0[1]	464.[2]	438.00	447.00	441.00	451.00
Average cubic feet gas per pound coal per hour	1.08	1.02	1.16	1.09	0.89	1.10	1.50
Average cu. ft. gas per lb. coal, M & A free, pr. hr.	1.18	1.14	1.27	1.15	0.98	1.20	1.65
Weight balance—products per cent. by weight—							
Coke	67.1	67.5	64.7	68 5	69.00	66.00	66.7
Gas	14.7	16.3	15.4	14.7	16.2	16.00	16.3
Tar	8.1	5.2	....	12.4	7.00	6.5	6.6
Ammonia liquor	....	4.2	4.2	4.3	5.6	5.2	5.8
Unaccounted for	....	6.8	....	0.1	2.2	6.3	4.5

Average Composition of Coal.	As Charged.	Moisture Free.	Moisture and Ash Free.
Moisture	2.21	....	....
Volatile	33.66	34.43	36.78
Fixed carbon	57.94	59.24	63.22
Ash	6.19	6.33	....
Sulphur	1.12	1.15	1.23
Calorific value, B.T.U.	15,411.00	15,780.00	16,830.00

1. Retort badly coated with carbon.
2. Retort recently cleaned and free from carbon.
3. Coal has been weathered two winters but was approximately air-dry when charged.

duction of gas falls to about ¼ of the average rate. The rate of evolution of the gas falls off very rapidly at the end of the test, and the time for closing the test is readily told.

With the Hellier coal, although the weight of charge varies from 300 to 500 pounds, and the retort temperature from 1,841 to 2,030° F., the greatest variation from the mean rate of 447 feet per hour is only 7 per cent. The most discrepant figure is the low value of 416 feet on test 21, where the log of the test reports that the retort was badly coated with carbon. This fact seems to have a bearing as will be shown later. Rejecting this figure, and averaging the other four, the greatest deviation from the mean drops to less than 5 per cent. The seven tests on Pittsburgh coal, made at intervals during 18

In the same way the average rate of yield on the four tests with the LaFollette, Tenn., coal was 465 cubic feet per hour, with a maximum deviation of 5 per cent., although the charges varied from 300 to 500 pounds. With the Harrisburg (Ills.) coal the average rate was 411 cubic feet per hour, with a maximum deviation of 9 per cent. on four tests of charges, varying from 300 to 500 pounds, including one 400-pound charge tested in an extremely cold retort, which was badly coated with carbon. If this test were eliminated, the maximum variation from the average would be less than 5 per cent. The two closely related West Virginia coals, from Monangah and Holden, were tested six times, either alone or mixed with each other, on charges varying from 300 to 600 pounds. The average rate of gas yield on these six tests is 491 cubic feet of gas per hour, with a maximum variation of 8 per cent. The greatest deviation from the average is shown by the 600-pound charge in a rather cold retort. These results are summarized in Table VI.

TABLE IV.—*Data of Tests on Coal AA10 From La Follette, Tenn.*

Data on Tests.	Test No. 31.	Test No. 40.	Test No. 41.	Test No. 42.
Coal charged, pounds	400.00	298.00	400.00	500.00
Average temperature, exterior of retort, degs. F	1,938.00	....	....	....
Yields per pound coal as charged—				
Gas, cubic feet corrected	5.5	5.68	5.29	5.59
Candle power, average	15.9	13 8	16.3	16.8
Candle feet	81.9	78.4	86.3	94.0
B.T.U. per cubic feet gross	641.0	631.0	652.0	655.0
Total B.T.U. in gas from 1 pound coal	3,530.0	3,580.0	3,450.0	3,660.0
Yields per pound coal, M. & A. free—				
Gas, cubic feet corrected	5.79	5.97	5.55	5.87
Candle feet	92.1	82.5	90,5	98.8
Total B.T.U. in gas per pound coal, M. & A. free	3,710.0	3,770.0	3,620.0	3,840.0
NH_3 pounds per ton coal as charged	7.39	6.21	5.79	6.30
NH_3 pounds per ton coal, M. & A. free	7.82	6.52	6.08	6.62
Yields per hour—				
Duration of carbonization, hours	4.67	3.83	4.58	5.75
Total cubic feet of gas from charge	2.190.00	1,693.00	2.114.00	2,795.00
Average cubic feet gas per hour from charge	470.00	442 00	462.00	486.00
Average cubic feet gas per pound coal per hour	1.17	1.48	1.16	0.97
Average cubic feet gas per pound coal, M. & A. free, per hour	1.24	1.56	1.22	1.02
Weight Balance—products per cent. by weight—				
Coke	66.8	63.4	63.8	64.0
Gas	16.8	17.7	16.4	17.0
Tar	9.5	8.2	8.2	7.3
Ammonia liquor	5.8	6.6	6.2	6 4
Unaccounted-for	1.1	4.1	5.3	5.3

Average Composition of Coal.	As Charged.	Moisture Free.	Moisture and Ash Free.
Moisture	2.70	....	....
Volatile	37.48	38.53	39.40
Fixed carbon	57.68	59.27	60.60
Ash	2.14	2.20	....
Sulphur	0.79	0.81	0.85
Calorific value, B.T.U	14,303.00	14,700.00	15,030.00

is such a lack of systematic effect of these variables, that it must be concluded that the rate of gas evolution for a given retort is a constant quite independent of the size of charge, and to a less degree independent of variations in retort temperature, within working limits.

Let us consider the phenomena taking place within the retort, and see if there is any theoretical ground for expecting this result. A

TABLE V.—*Data on Tests on Coal From West Virginia.*

Data on Tests.	Monangah, AA14. Test No. 36B.	Holden, AA13. Test No. 49.	Holden, AA13. Test No. 50.	Mixed Monangah and Holden. Test No. 52.	Mixed Monangah and Holden. Test No. 53.
Coal charged, pounds	400.00	500.00	400.00	600.00	500.00
Average temperature, exterior of retort, degs. F	2,188.00	1,889.00	1,899.00	1,825.00	1,857.00
Yields per pound coal as charged—					
Gas, cubic feet corrected	5.36	5.24	5.14	5.26	4.86
Candle power, average	14.9	15.5	15.9	13.8	15.2
Candle feet	80.0	81.3	81.8	72.7	73.8
B. T. U. per cubic feet gross	615.0	642.0	645.0	620.0	649.0
Total B. T. U. in gas from 1 pound coal	3,300.0	3,420.0	3,320.0	3,260.0	3,152.0
Yields per pound coal, M. & A. free—					
Gas, cubic feet corrected	5.74	5.65	5.54	5.71	5.27
Candle feet	85.5	87.6	88.1	78.9	86.1
Total B. T. U. in gas per pound coal, M. & A. free	3,520.0	3,630.0	3,570.0	3,540.0	3,420.0
NH, pounds per ton coal as charged	4.48	3.87	3.88	4.51	4.37
NH, pounds per ton coal, M. & A. free	4.79	4.17	4.20	4.90	4.73
Yields per hour—					
Duration of carbonization, hours	4.47	5.08	4.08	7.00	5.08
Total cubic feet of gas from charge	2,146.0	2,621.0	2,036.0	3,157.0	2,428.0
Average cubic feet gas per hour from charge	480.0	516.0	504.0	451.0	479.0
" " " " " pound coal per hour	1.20	1.03	1.26	0.75	0.96
" " " " " coal, M. & A. free, per hour	1.28	1.11	1.35	0.82	1.06
Weight balance—products per cent. by weight—					
Coke	65.5	66.0	65.7	65.3	63.4
Gas	....	16.3	15.9	16.3	15.1
Tar	6.9	8.8	8.2	8.2	8.1
Ammonia liquor	5.6	5.5	5.3	5.9	10.9
Unaccounted-for	....	3.4	4.8	4.2	2.5

Average Composition of Coal.	Monangah. As Charged.	Monangah. Moisture Free.	Monangah. Moisture and Ash Free.	Holden. As Charged.	Holden. Moisture Free.	Holden. Moisture and Ash Free.	Mixed Monangah and Holden. As Charged.	Mixed Monangah and Holden. Moisture Free.	Mixed Monangah and Holden. Moisture and Ash Free.
Moisture	1.91	....	....	1.87	....	....	2.00	....	....
Volatile	36.40	37.11	39.27	36.42	37.11	39.24	36.24	36.97	39.25
Fixed carbon	56.31	57.41	60.73	56.37	57.45	60.76	55.99	57.14	60,75
Ash	5.38	5.48	....	5.34	5.44	....	5.77	5.89	....
Sulphur	0.88	0.90	0.96	1.16	1.18	1.25	0.83	0.85	0.90
Calorific value, B. T. U	14,088.00	14,340.00	15,190.00	14,143.00	14,413.00	15,220.00	13,964.00	14,249.00	15,130.00

TABLE VI.—*Comparison of Rate of Evolution of Gas from One Retort with Different Charges.*

Coal Used.	Number of Tests Averaged.	Range in Weight of Coal Charged.	Average Gas Yield per Hour.	Range in Mean Retort Temperature.	Maximum Deviation from Average Per Cent.
Hellier, Ky	5	300-500	447	1,841-2,036	7.0
Scott Haven, Pa.	7	300-500	441	1,844-1,994	7.5
LaFollette, Tenn.	4	298-500	465	?	5.0
Harrisburg, Ills.	4	300-500	411	1,777-1,979	9.0
Holden and Monangah, W. Va.	5	300 600	491	1,825-2,188	8.0

The variation in the mean rate of gas evolution as shown by these tests is so disproportionately small, when compared with the difference in the size of charge and the difference in temperature, and there

charge of coal, low in moisture (as all our coals were) is thrown into a retort where destructive distillation at once commences. It is held by some that the destructive distillation of coal is an exothermic process, and that the only function of the hot retort is to start the reaction. If that were the case, the rate of reaction, after it is started, should be entirely independent of the external temperature and practically independent of the size of the charge. There is evidence to support the view that, at certain stages of the distillation, heat is evolved, but it can hardly be said to apply to the process as a whole.

If we hold the more tenable theory that destructive distillation is accompanied by an absorption of heat, then it is evident that the rate of distillation must be regulated by the amount of heat transmitted through the wall of the retort. The transmission of heat should, for

any given retort, be a function of the difference between the temperature outside of the retort and that prevailing within the retort at the point where distillation is taking place. It was shown, in a paper presented before your Association 2 years ago[1] that coal, when gradually heated, lost most of its volatile matter below a red heat. The process taking place in the retort must be considered as a gradual heating, the external shell of coke transmitting heat slowly to the layer of raw coal next to it, which absorbs the heat and converts it into the potential energy of the gas. The temperature of this zone of coal undergoing distillation must, therefore, be approximately a constant, and its location must be steadily advancing from the neighborhood of the wall towards the center of the retort, so that the heat is transmitted to it through a constantly thickening wall of coke. The rate of progress would not be materially different for a 300-pound charge than for a 500 pound charge, and hence the rate of gas evolution will be independent of the weight of the charge.

The same line of reasoning demands that there should be a more rapid transmission of heat, and hence a more rapid evolution of gas, when the gases surrounding the retort are at a high temperature than at a low one. This only holds, however, for a retort which is always in the same condition. A retort in operation builds within itself an insulating layer of carbon, which is periodically stripped off. We have before alluded to the apparent effect of this insulating layer, and quote specifically the two tests on the Pittsburgh coal, which are the extremes of the series as regards rate of gas production. Test 19, with its retort badly coated with carbon, showed the low figure of 408 cubic feet of gas per hour. Test 20, with a freshly decarbonized retort, gave the high value of 464 cubic feet. The temperature in the two tests was practically the same. The effect of temperature change would probably be almost proportional to its extent expressed in per cent. A variation of 200° is a large one, but it is only 10 per cent. of the average temperature, and we believe that a change of this magnitude would be readily masked by the effect of condition of the retort and also by the variable which we have not yet mentioned—pressure on the retort.

If it be granted that the rate of gas production is a function primarily of the rate of heat transmission to the charge, it becomes very evident why silica retorts, for example, give results differing from those of ordinary firebrick, and why some kinds of fireclay may be better than others.

Though the rate of gas production is fairly constant for any one coal, it differs with different coals, the extremes in our tests being the Illinois coal, with its average of 411 cubic feet per hour and the West Virginia coal with 491 feet per hour. There does not seem any systematic variation in th chemical analysis of the coals to give the reason for this different rate of gasification. It may lie in the physical properties of the coal.

Rate of Evolution of Gas per Pound of Coal.—It was shown in the preceding section that the rate of gas evolution from a retort was fairly constant for a given coal, independent of the weight of the charge. It follows, as a conclusion, that the rate of evolution of gas per pound of coal must be a direct function of the weight of the charge, being more rapid for light charges than for heavy. The variation is shown graphically for ½-hour periods in Plate I. for the Hellier, Kentucky, coal, where there are plotted under each other the yield be ½-hour intervals per retort and per ton of coal. The rate per ½ hour per ton of coal is lowest with the heavy charge, and highest with the light one. The shape of these curves is characteristic of all the tests.

The ash of the coal is an inert constituent, and the moisture exerts only a slight influence on the amount of gas made, so that an exact comparison is best made on a basis of coal free from moisture and ash. The relation between the rate of gas evolution per pound coal and the weight charged, both figured to a moisture and ash free basis, is shown graphically in Plate II. The only point, which is far off the curves in any of the tests, is the one for test 35, made on the Illinois coal with a retort heavily coated with carbon and at an extremely low temperature.

If it be granted that the yield of gas from each retort is a constant, which is the product of the weight of the charge and the rate of gas evolved per pound of coal, the equation becomes of the form $xy = c$, which gives a hyperbola of the general form shown by the small curve in the upper corner of Plate II.

The range of our experiments covers only a small portion of this hyperbolic curve, but the data as plotted in Plate II. show five rough-

1. "Destructive Distillation of Coal at Low Temperatures," by Alfred H. White, Fred. E. Park and William A. Dunkley. "Proceedings," Michigan Gas Association, 1908.

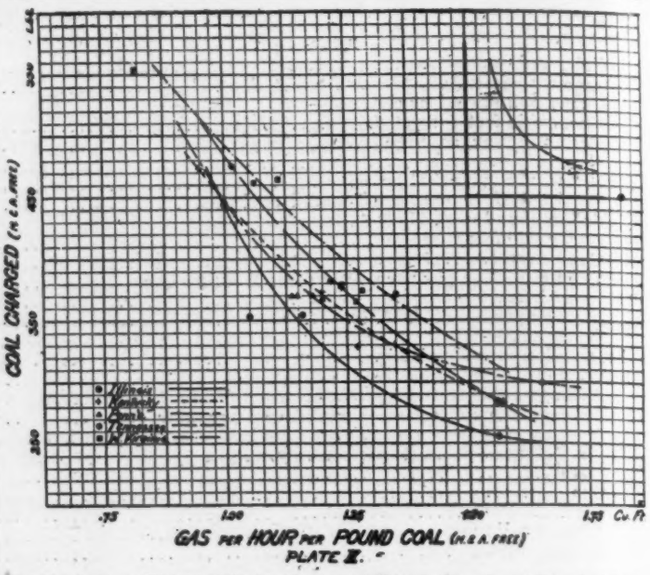

PLATE II.

Relation between Weight of Coal in Charge and Gas per Hour from 1 Pound of Coal.

ly parallel curves, whose general direction indicates a harmony with the mathematical expression. The data are not accurate enough to make it worth while to try to determine the extent of the deviation. There is not sufficient evidence to show whether a rapid or a slow rate of gas evolution per pound of coal is better for commercial purposes.

Influence of Weight of Charge.—A special effort was made to determine the influence of size of charge. Each of the 5 coals mentioned in this report was tested on a charge of 300, 400 and 500 pounds, the three tests being made consecutively on a single long working day, in order that variables due to the condition of the retort and to the firing might be eliminated so far as possible. It is unfortunate that pyrometric troubles, mentioned elsewhere, prevented temperature measurements being taken on some of these tests; but it is not unreasonable to assume that ordinarily the temperature of the retort remained fairly constant during the day. The results are given in figures in Table IV., and are summarized graphically in Plate III.

The percentage yield of coke is largest for the heavy charge and decreases for the light charges, except in the case of the Pittsburgh coal, where the 300-pound charge is reported with a higher percentage yield of coke than the 400. The difficulty of raking the retorts perfectly clean, the danger of spilling in drawing the coke and the necessity of using the less sensitive scales on the retort house floor for weighing the hot coke, introduce a considerable probable error into these figures for coke, but the evidence is sufficiently in one direction to make it probable that the heavy charges give a higher percentage of coke than light ones. This may be due to reactions within the retort, but is perhaps more probably to be attributed to the fact that the loss in drawing, etc., is a relatively constant weight, and hence appears as a higher percentage on the light charges.

No constant effect of size of charge can be traced in the quantity of gas produced, nor in its candle power or heating value. The curves of Plate III. show simply a haphazard variation in yield of gas, candle power, heating value, candle feet and B. T. U. in gas from 1 pound of coal. The yield of tar, ammoniacal liquor, NH_3 and unaccounted for loss varies also without any uniformity. It is apparent that there is some other variable much more important than the size of the charge.

Influence of Variations in Pressure on Retort.—In our tests we have desired to keep the retort under a back pressure which would not be over $\frac{1}{16}$ of an inch of water. The gauges were closely watched, and every effort made to keep the pressure constant, but we are free to confess that the results were not altogether satisfactory, although we believe that our control of the pressure was much better than is usual in retort house practice. We have no means of estimating quantitatively the mean variation in pressure for one test as compared with another; but there is evidence that it has been an important unaccounted-for variable. Our reasons which are purely theoretical, are as follows:

A retort has a porous body readily permeable to gases. Under the usual manufacturing conditions, where a slight pressure is kept on the inside of the retort, some of the gas is forced out into the fire

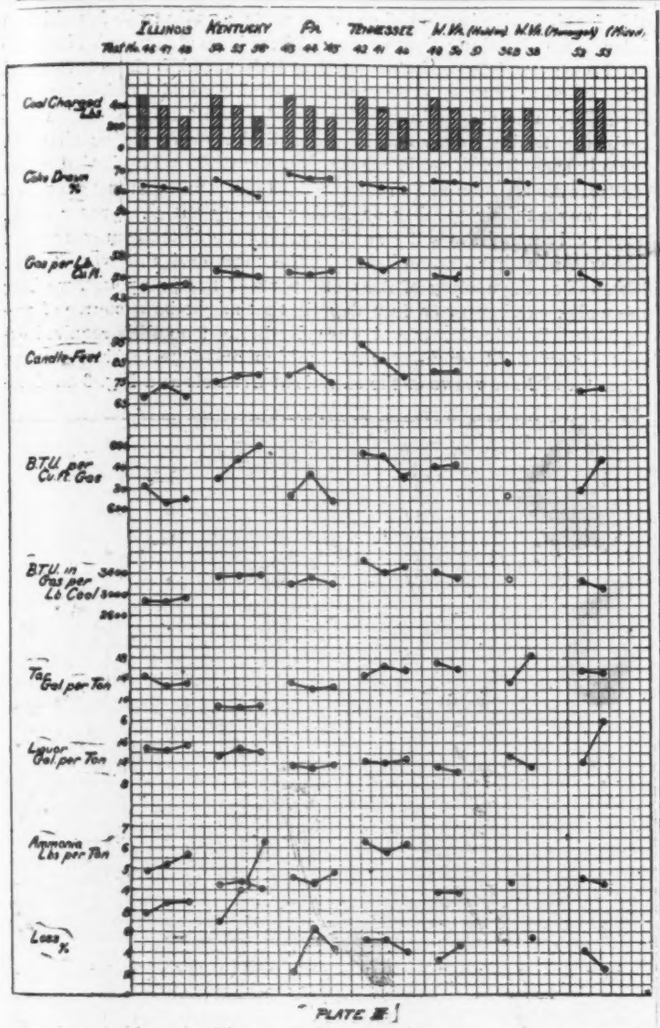

PLATE E

Curves Showing Lack of Relation Between Weight of Coal Charged and Quality and Quantity of Products.

space and lost. This gas becomes badly cracked as it strikes the hot wall of the retort, and builds up the dense wall of carbon which accumulates on the inside of the retort. Conversely, the presence of this dense coat of carbon is proof that gases are being forced out of the retort. If gases were being sucked in, the inside of the retort would be clean. If there were no interchange in either direction, at the most only a thin scale of carbon could form.

Let us consider how much variation from the mean amount of gas there is to be accounted for, and, to eliminate the influence of ash and moisture, calculate the figures on a basis of coal free from moisture and ash.

Name of Coal.	Number Tests Averaged.	Cubic Feet Gas per Pound Coal, M. & A. Free.	Maximum Deviation from Average, Per Cent.
Illinois.....	4	5.19	5.0
Kentucky.....	5	5.30	5.6
Pennsylvania	7	5.57	7.5
Tennessee.....	4	5.79	4.1
West Virginia.....	5	5.64	7.3

This shows that, in any of our tests, a loss of 7.5 per cent. of gas through the retort wall, or a gain, through sucking 7.5 per cent. of smoke gases into the retort, would have been sufficient to account for all the variation from the average yield of gas. It is not probable that 7.5 per cent. of smoke gases were sucked into the retort in any test, but it is entirely possible that more than 7.5 per cent. may have been forced out. We have no data on which to base an estimate of the amount of gas which might be forced through a retort by a pressure of $\frac{1}{10}$ inch of water, and our conclusion as to the probable importance of this variable is reached mainly because it seems to be the only cause whose unknown variation is sufficient to account for the results. Indirect evidence of the correctness of our view is afforded by the close agreement of the figures for heat value in the gas from a pound of coal—a value where the retort pressure is of less importance. This will be discussed in a following section.

Measurement of Retort Temperature.—The question of influence of temperature must be treated with many reservations. It is extremely difficult to measure retort temperature. The readings of a thermocouple placed inside of the retort are almost valueless, since they record only the immediate local surroundings of the couple, which may be cooled by contact with a projecting piece of coal or be unduly heated through proximity to the roof of the retort. We have found the temperature of the outside of the retort to give the most reliable indications, but have had vexatious and expensive experiences in attempts to measure it. The retort which we use is in the end bench of the battery, and there is an inch hole in the masonry opposite the middle of the retort, designed for the insertion of a thermocouple. The temperature to be measured runs as high as 2,200° F. A platinum thermocouple must be protected absolutely from the furnace gases, and it is difficult to find a satisfactory protective covering for continuous service. The Hoskins thermocouple has been equally unsatisfactory on account of the tendency to break when the wires contract on cooling. It was difficult to use optical pyrometers, on account of the presence of smoke in the peep hole, but this was overcome by luting into the brickwork a 1¼-inch iron pipe terminating in a tee, which carried on one branch a cap drilled with an inch hole closed by a plate of glass. Through the other arm of the tee air was blown in just sufficient amount to keep the smoke back. This device proved very satisfactory. The Wanner pyrometer is unfitted for this work, because of the small aperture of the peep hole. It is unsatisfactory also because it is inaccurate unless its storage battery is charged to the proper voltage.

The instrument we have come to rely on is the Morse thermogauge. This consists of a telescope in whose tube is a small incandescent electric lamp. A portable storage battery, a mille-ammeter and a small rheostat, fastened to the telescope, complete the equipment. In operation the telescope is pointed at the retort, and the current flowing through the lamp is adjusted by the rheostat until the color of the filament blends with that of the furnace. The readings of the mille-ammeter give, by reference to the calibration table, the temperature. The telescope is made with a large objective, so there is no trouble in locating the object desired, a feature which will be appreciated by those who have worked with the other forms of optical pyrometers. It is, of course, subject to the limitations of all optical pyrometers, the most important being that it cannot be used where there are luminous flames, nor where there is a thick smoke. It is admirably adapted for taking the temperature of the interior of retorts after the charge has been drawn. Our observations indicate that, if the charge has been thoroughly burned off, the temperature of the inside of the retort, after the charge is drawn, is almost as high as that of the outside. Here are the results of a few observations:

Exterior of Retort Before Drawing Charge.	Interior of Retort After Drawing Charge.
2,010 degs. F.	1,986 degs. F.
1,914 degs. F.	1,908 degs. F.

It would thus seem that the temperature of the empty retort, as determined by an optical pyrometer, is a reliable indication of the furnace operation.

Influence of Retort Temperature.—We cannot detect any systematic effect of temperature in the figures for yield of gas, candle power or heat value. This is probably, as explained previously, due to the disturbing influence of variations in pressure on the retort. The values for the B.T.U. in the gas from 1 pound of coal are less liable to disturbance from variations in pressure. This value is obtained by multiplying the B.T.U. per cubic foot by the cubic feet of gas per pound. If we assume that the pressure within the retort is high, gas will be lost; but the heat value of the gas not lost will be unaffected. If there is suction on the retort, smoke gases will be pulled in, but it is not likely that any oxygen will get into the retort through the layer of carbon lining it. The effect of this smoke gas will be to lower the heat value of the gas by dilution and to increase the volume of gas by the same proportion. The product of the two, which is the B.T.U. per pound of coal, will be unaffected by the dilution. Since the B.T.U. in the gas per pound of coal are unaffected by suction on the retort, and as only one of the two factors used in its calculation is affected by pressure, the value thus obtained should be relatively independent of small variations in the retort pressure.

The figures for B.T.U. in the gas per pound of coal, free from moisture and ash, indicate a systematic variation with the retort temperature, imperfectly shown but nevertheless distinct. There are not so many tests available for this comparison since, on account of exasperating failures of thermocouples, there are some tests without tempera-

ture data. There are not enough points, nor are the data accurate enough, to allow the curves to be drawn, but the general direction is shown by the following figures, which include all the tests for which temperature measurements are available.

TABLE VII.

Name of Coal.	Test No.	Retort Temperature.	B.T.U. in Gas from 1 Pound Coal, M. & A. Free.
Harrisburgh, Ills.	35	1,777	3,120
	48	1,819	3,330
	47	1,954	3,220
	46	1,979	3,160
Hellier, Ky.	55	1,841	3,550
	56	1,851	3,560
	54	1,864	3,530
	30	2,020	3,350
	21	2,036	3,340
Scott Haven, Pa.	32	1,844	3,690
	20	1,922	3,540
	19	1,925	3,460
	18	1,994	3,180
Monangah and Holden, W.Va.	52	1,825	3,540
	53	1,857	3,420
	49	1,889	3,630
	50	1,899	3,570
	36B	2,188	3,520

These figures indicate a maximum value for B. T. U. in gas from 1 pound of coal at a temperature between 1,800° and 1,900° F., the values decreasing for lower and higher temperatures. This general result would be expected from theoretical reasoning. At very low temperatures the yield of gas falls off rapidly without a correspondingly large increase in the heating value. At very high temperatures the heating value of the gas falls off without a corresponding increase in the quantity. Temperature cannot be the only variable affecting this value, but it appears to be the important one. It must be emphasized that no quantitative significance can be attached to these figures. They are presented merely as indicating the general effect of change of temperature.

Summary.—The present paper presents an analysis of the results of 25 tests on five coals. It is shown that the rate of gas production per hour from a retort is independent of the weight of the charge; in other words, that a given retort will yield a constant quantity of gas per day, irrespective of the weight of the charges, provided the coke is drawn as soon as the gas is off, and that the retort is kept in continuous operation. The rate of gas evolution is apparently a function of the rate of heat transmission through the walls of the retort, and this rate of heat transmission is more affected by the thickness of the skin of carbon on the inside of the retort than by ordinary variations in furnace temperature.

Systematic attempts were made to determine the effect of variation in the weight of the charge of coal by running consecutive tests on 300, 400 and 500-pound charges of these coals. There is no constant effect of the difference in weight of charge to be detected, either in quantity of gas, candle power or heat value. The disturbing factor is believed to be variable retort pressure, causing leakage of gas through the wall of the retort. This variable is believed to have been important enough in our experiments to have also masked the effect of temperature on the quantity of gas and on its candle power and heat value. The effect of temperature can be detected in the values for the B. T. U. in the gas from a pound of coal, which show an apparent maximum at moderate retort temperatures with decreasing values at higher and lower temperatures.

It is hoped that it will be possible during the coming year to examine more closely the important subject of influence of retort pressure.

The Humphrey Internal Combustion Pump, as Seen at the Brussels Exposition.

Iron Age says that one of the technical excursions enjoyed by those who attended the joint meeting of the Institution of Mechanical Engineers and the American Society of Mechanical Engineers in England last July was that to the Pump and Power Company's testing station, at Dudley Port, Tipton, near Birmingham. The report of the meeting, which appeared in the issue for August 18 of our contemporary, gives a brief account of the Humphrey internal combustion pumps, which were there seen in action. A pump similar to these is installed in the machinery section of the Brussels Exposition and attracts a great deal of interest, being probably the most novel exhibit. All of the pumps invented by H. A. Humphrey are remarkable for their elimination of so many parts usually to be found in an internal combustion prime mover. There is no piston, or, at least, no solid one; no piston rods, connecting rods, crankshaft nor flywheel of the revolving type. The functions of piston and flywheel are performed by a moving column of water, the oscillation of which controls the timing of events in the cylinder or explosion chamber. Strictly speaking, the only mechanism about the pump is that which controls the ignition and so interlocks the inlet and exhaust gas valves as to prevent their opening or closing at any but the proper times. These valves and the water suction valves complete the moving parts. The water further accomplishes in the most desirable way—that is, internally—the cooling of the metal parts of the pump and, washing the walls, carring away any deposit that might be a source of preignition. Lubrication troubles are eliminated; no oil is required except a very slight amount for the ignition and interlocking gearing. Figs. 1 and 2 are views of the exhibit at Brussels and Fig. 3 an elevation and plan of a precisely similar plant, with the addition of a gas producer, for the pump is normally intended to be operated with producer gas. It happens that at Brussels illuminating gas is used, but an inactive producer of a size corresponding to the pump capacity is shown, and the small amount of space it occupies with respect to that of the pump is a striking contrast, as is well brought out in Fig. 3. Fig. 4 is a diagram of one of the earlier Humphrey pumps, which has been tested by Prof. Wm. C. Unwin, and Fig. 5 a detail of the latest type of valve gear.

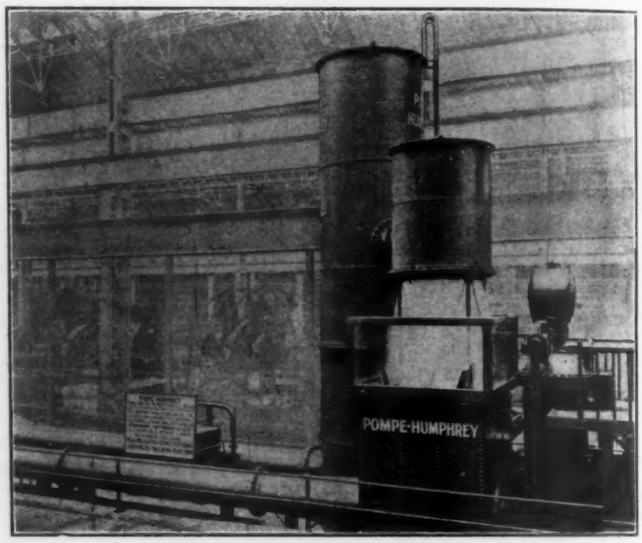

Fig. 1 —The Humphrey Internal Combustion Pump, Exhibited by the Pump and Power Co., Ltd., London, England, at the Brussels Exposition.

Fig. 4 will serve best to make clear an understanding of the principle of the action of the Humphrey pump. The thermo-dynamic cycle on which the pump works has a greater efficiency even than the Otto cycle, for the reason that it provides that which is theoretically required, 4 unequal strokes. The longest stroke is that which occurs during combustion and expansion, while the liquid is forced through the delivery pipe to the elevated tank. On the return oscillation the gases are exhausted. With the next reversal a still shorter stroke occurs, during which a fresh combustible mixture is drawn in, and on the fourth and shortest stroke this mixture is compressed ready for firing and the repetition of the cycle. There is no valve in the discharge line, so that the water has a free passage from the explosion chamber to the high level tank.

The action of the pump more in detail is as follows: Assuming that it is to be started for the very first time, it is necessary to get the water in motion before the pump will take up its regular cycle of operations. For this reason compressed air is introduced in the combustion chamber, forcing the water to a certain height in the elevated tank; then the exhaust valve is suddenly opened by hand and the surging of the water established produces the necessary suction to admit a charge through the gas inlet and compress it ready for firing. Following an explosion, the gas expands, forcing the liquid out and toward the elevated tank. When the gas has expanded to atmospheric pressure the moving column of water has attained a velocity which causes it to continue to move until the static head in the discharge pipe brings it to rest. As soon as the pressure is below that

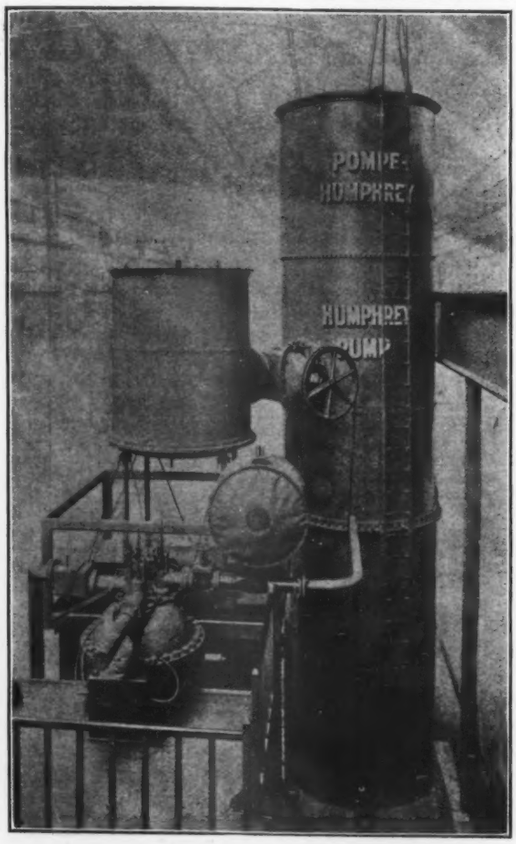

Fig. 2.—Another View of the Humphrey Pump at the Brussels Exposition.

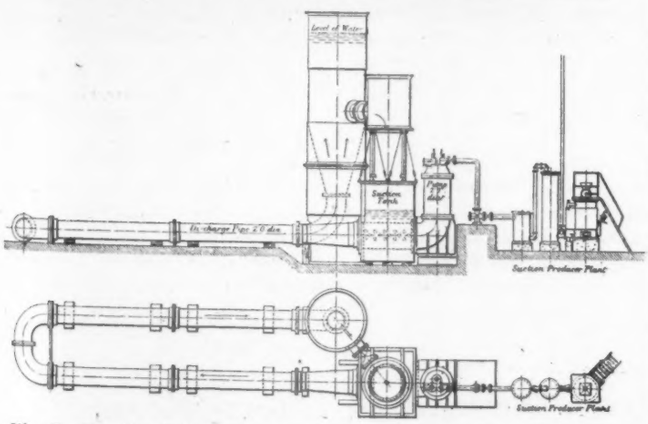

Fig. 3.—Elevation and Plan of a Humphrey Pumping Plant Complete with Gas Producer.

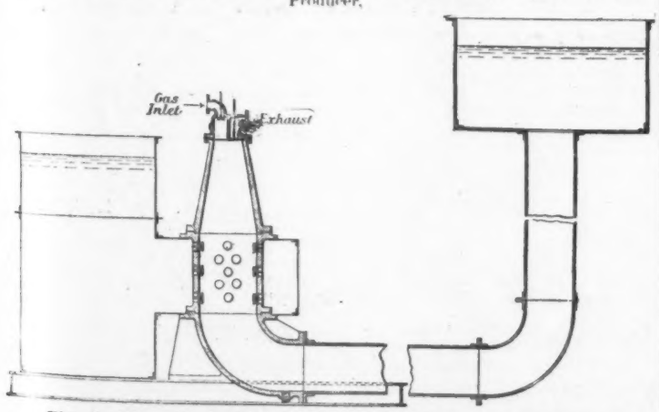

Fig. 4.—Diagrammatic Elevation of One of the First Humphrey Pumps.

of the atmosphere the exhaust gas valve and the suction water valves open, admitting water from the low-level tank, part of which follows the column in the discharge pipe, and the remainder fills the combustion chamber part way or nearly to the level in the low-level tank. This has partly exhausted the burnt gases, and when the

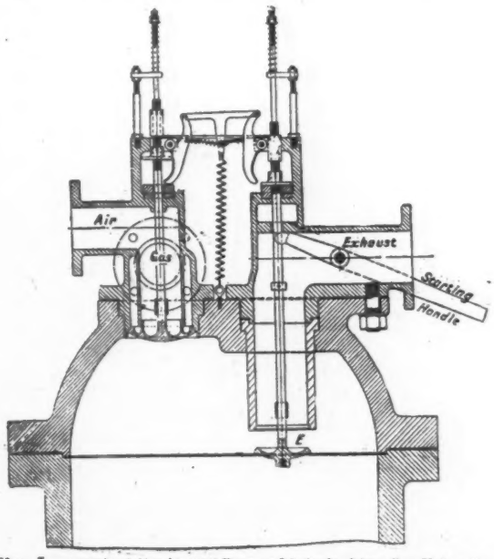

Fig. 5.—Detail of the Latest Form of Interlocking Gas Valve Gear.

column of liquid returns the water suction valves are closed by their springs and the exhausting of the combustion chamber continues until the liquid rises to the level of and closes the exhaust valve. There is still pocketed a small amount of burnt gas in the cushion space under the inlet valve. A further movement of the column of liquid compresses this, causing the second outward movement of the liquid, and when this has created a suction in the explosion space the first charge of gas is drawn through the inlet valve, is compressed by the next return of the surging column and is fired at the point of maximum compression. When the pump is stopped a charge of gas is always left in the explosion chamber and subsequent starting is effected simply by closing the ignition circuit.

While it is not necessary to the operation of the pump to insure that the pocketed gas should be removed entirely on the exhaust stroke, it has been thought best to add a scavenging valve, not shown in Fig. 4, which opens at the instant that the exhaust valve opens and allows air to be drawn in above the exhaust gases, so that when the exhaust is completed only practically pure air is pocketed in the explosion chamber. Ordinarily with a scavenging valve in use a non-return valve is provided in the exhaust, so that no burnt gases will be drawn back through the exhaust valve when the latter is open, but only fresh air be drawn in through the scavenging valve. Even without the use of the scavenging valve the pump explodes with absolute regularity and certainty.

As the opening and closing of the gas valves depends entirely upon difference of pressure on their two sides, it will be seen that some special means is necessary, so that both will not open and close at the same time. Each must open and close before the other is opened and not open again until the other has opened and closed. One form of valve gear by which this is accomplished is shown in Fig. 5, which, however, shows the admission and exhaust valves only and not the scavenging valve. It will be noticed that the admission valve is near the top of the chamber, while the exhaust valve is considerably lower. In the position shown it may be taken that the exhaust valve has just opened by its own weight and that the products of combustion are being driven out. In the meantime the inlet valve must be held closed. This is effected by a steel plate or bolt, which is free to slide sideways. One end of it projects beneath a nut on the inlet valve spindle and prevents that valve from opening. The plate, under the influence of the one of the two springs which is in tension, tends to return to the right, but cannot do so until the exhaust valve has been returned to its seat by the returning water. As soon as the nut on its spindle is high enough the plate will be pushed under it by the tension of the spring to hold this valve up, and at the same time the inlet valve will be left free to fall the next time the pressure in the chamber is below that of atmosphere—that is, when the water retires. During its fall the lever will be pushed over to place the other spring in tension, so that the plate will shoot back under the nut on the inlet valve stem when that valve is again raised, which occurs on the compression stroke. The exhaust valve will then be free to open, but cannot do so until the charge in the chamber has expanded to atmospheric pressure.

Since it has been found that water on the spark plug causes no

trouble, an ordinary type of plug, as used on automobiles, is now provided, and the spark is produced by a sparking coil and battery similar to those ordinarily employed. The timing gear is very ingenious and yet simple. Its function is to fire the charge at the instant when compression has reached its maximum. It comprises a small piston and cylinder connected to the pump chamber wall so that the piston will move according to the pressure within the chamber. The piston is connected to a steel band passing around a pulley having its other end attached to a spring. Attached to the pulley is a contact lever which plays between two stops, one of which is idle, while the other is alive and closes the ignition circuit. As this piston moves outward, due to compression in the cylinder, it holds the contact against the idle stop, but, with the first slight decrease of pressure within the cylinder, the contact is thrown to the other stop and closes the ignition circuit.

It is evident that the discharge pipe must be of sufficient length to obtain the surging of a certain mass of water, which depends on the head pumped against and the periodicity required. The larger the pipe, and, therefore, the shorter its length, for a given mass of water, the more frequent will be the strokes of the pump and the greater the mass of water the greater can be the head pumped against for a given capacity. In the test of the pump shown in Fig. 4, Professor Unwin found the coal consumption per pump horse power hour to be 1.06 pounds, which corresponds to 83.1 cubic feet of gas per pump horse power hour. A still better performance was obtained with the pump at Dudley Port, which is a counterpart of the one at Brussels. It was tested by Prof. Eugen Meyer. The figures from this test are not yet available, but the builder, the Pump and Power Company, reports that the best results so far returned have been 73 cubic feet of gas per pump horse power hour, the thermal value of the gas being 150 B.T.U. per cubic foot, which is equivalent to an anthracite coal consumption of 0.95 pound per pump horse power hour. The head pumped against was 35.6 feet and the discharge 3,150 gallons per minute. All of these pumps are of relatively low lift, but the inventor has means for increasing the delivery pressure by what is called an intensifier.

An interesting application is now being worked out by German licensees, who are constructing a 1,000-horse power pump to show the possibilities of using the principle in the production of power. The pump is designed to put 1¼ tons of water per second under a pressure of 7 atmospheres and the water will be used through a turbine to generate electric current. The plant as a whole, it is declared, will occupy less space than one of the same output run by an ordinary gas eugine. Mr. Humphrey has also worked out the problem of compressing air to any required pressure needed in engineering operations and also for the low pressures required in blast furnace blowing engines. The compressor is even simpler than the pump; no water valves are needed, as a constant volume of water is reciprocated between the pump and compressing chamber. It is confidently believed by many who have witnessed the performance of the Humphrey pump that its possible applications for useful purposes are many and that it marks the beginning of a new engineering development, due to the remarkable economy it promises.

Visitings of a Veteran Gas Engineer.—No. III.

Dear JOURNAL: Leaving Portland, Ore., on the S. F. & P. S. S. Company's steamer "Beaver," San Francisco was sighted early the morning of the second day out. When calling at the offices of the "Honorary" as well as "Active" Secretaries of the Pacific Coast Gas Association, the writer met a cordial reception from said officers, and no less so from the Editor of the "Experience Department," Pacific Coast Gas Association, Mr. Leon B., proud son of an able father, yclept "The Chief," Mr. E. C. Jones.

The views of San Francisco at this date induce a combination of awe and intense admiration.

The plentiful evidences to be seen of the great catastrophe of 4 years ago are responsible for the former, and the great and beautiful city as it is, standing over the ashes, and partly surrounded by the ruins of the past, cannot but cause wonder at the courage and resourcefulness of the California people.

A visit to the Potrero station of the San Francisco Gas and Electric Company, was made under the ægis of Mr. L. B. Jones, its Superintendent, where was seen a well kept, though not "fancy" gas works of the present distinctive Pacific Coast type, viz., an oil-water gas works able to turn out 16,000,000 cubic feet of gas per diem, though at present making less. Most of your readers may be and likely are acquainted with the process of making water gas, using oil only, and no coal or coke whatever.

Eighteen years ago the writer was invited to inspect and test such an apparatus at Taylorsville, Ills. It was named the "Kendall Process," for its inventor and patentee, who, curiously enough, was a retired railroad freight agent. The process now used on this Coast is practically the same as the above. The generator of an ordinary water gas apparatus is filled with checkerbrick instead of fuel. These bricks are heated by injecting oil and air in suitable quantities, and, when the proper working heat has been attained, the fuel oil and air blasts are shut off and steam and gas oil (in some cases identical with the fuel oil) are injected, and thus the gas is made. At some of the plants seen the gas made is of very high illuminating power, and a low candle power water gas is produced in other apparatus, the two being mixed to the required proportions.

In the making of gas as above, large quantities of lampblack are formed, amounting to as much as 40 per cent. of the oil used in some cases. This lampblack is separated in a simple manner, and, after the excess of moisture has been reduced to about 8 or 9 per cent. it is used in the ordinary style of water gas apparatus generators as fuel, to produce the diluent gas previously mentioned; the lampblack is also used under the boilers. To arrive at the present results required much thought and experimental practice, far beyond that demonstrated in the original "Kendall Process," or adaptations of the same.

I have written you from Portland concerning the reheating and consequent desulphurizing process practiced there very succesfully. On interviewing San Francisco gas men, however, it was found that "doctors differ," and that, in fact, there is a wide divergence of opinion as to the utility of that process on part of the local gas men. But I am bound to say that nearly every argument used here against said process weakens the case of its opponents. The only one which is of debatable force is that, by compressing the gas (as, for instance, in the Pintsch process) the sulphur is eliminated without reheating. The writer is entirely neutral in the matter, and takes only an academic interest in the same, and thus, without bias, presents the result of his investigations to your readers. It does not matter the value of one penny to him whether anybody adopts or rejects that process, which, in his opinion, is a notable step of progress to be considered when gas is to be made, as stated in a previous letter. The Kendall process required 12 gallons of oil per 1,000 cubic feet of (?) candle power gas. At Portland, Ore., 10 gallons are said to be the quantity necessary; but in San Francisco they do it with 8 gallons—they say. At Portland the reheating process is shown, by the books of the Company, to cost less than 1 cent per 1,000 cubic feet, while here it is asserted that it naturally would cost at least 4 cents per 1,000, and that they save all this by the simple plan of making the oil company give them oil of low sulphur content at the cheapest rate. The reader can now form his own conclusions.

Bureau of Information, The American Gas Institute.

Under the direction of the Institute it has been decreed: 1. That the privilege of submitting questions be limited to members of the Institute. 2. Neither the Board of Directors of this Institute, nor the Institute as a body, make themselves in any way responsible for the statements of fact or expressions of view given out by the Bureau of Information.

BUREAU OF INFORMATION, THE AMERICAN GAS INSTITUTE,
HEADQUARTERS, GAS OFFICE BUILDING,
V. F. DEWEY, Chairman. DETROIT, MICH., Sept. 14, 1910.

Question No. 59.—"What relation exists, in the operation of a water gas machine, between the amount of air per minute per square foot of grate area during blast, and pounds of carbon per 1,000 feet of gas made and make of gas per hour?"

ANSWER BY MR. W. E. MCKAY, GEN. MGR., N. E. GAS AND COKE CO.

In running a generator of 50 square feet grate surface, with a positive blower, and making 21¼-candle power gas with 3.9 gallons of oil, 2¾ minutes blow, 5¼ minutes changing valves and steaming, it was found that 225 cubic feet of air was used per square foot of grate surface per minute, of which 144 cubic feet was used in the generator and 81 cubic feet as secondary air.

The make was 13,830 cubic feet per run, or 10,000 per hour, or 2,000 cubic feet per square foot of grate per hour. From a long series of

observations it appears that, with the same fuel, the pounds of carbon per 1,000 feet of gas made are quite constant for different rates of blast and make, within the limits of efficient control of heats.

Question No. 69.—"What is the best practice in velocity of gas permissible through; first, water gas set; second, oil gas set; third, coal gas works (in the above is meant velocity of gas through the connections and piping connecting the various units); fourth, water gas scrubbers of the spray or brick variety; fifth, purifying boxes; sixth, through gas works or connections; seventh, through multitubular condensers."

ANSWER BY THE BUREAU.

The main object in designing the connections through a water gas set is to avoid congestion, and consequent back pressure of the gas as far as possible, consistent with preserving the integrity of the units. In modern practice the velocity is from 3,000 to 4,000 feet of gas per minute during gas making time, the volume being computed at the existing temperature at which it passes through the connections. In oil gas practice this velocity is reduced to 2,000 to 2,500 feet per minute.

Coal gas practice would indicate the velocities at the different connections as follows:

Location.	Degs. F.	Velocity per Minute, Feet.
Inlet primary condenser.....	150	700
" water tube condenser.....	120	550
" scrubber.....	85	475
Outlet scrubber.....	75	460

In water gas scrubbers, assuming 50 per cent. of shell area available for gas passage, and an average temperature of 200°, the velocity is about 16½ feet per minute of actual gas making time. The accepted best practice regarding velocity of gas through purifiers is ¼ foot to ½ foot per second, or 60 to 75 feet per hour, calculating the purifiers as empty vessels. The average velocity of coal gas through the gas works connections is about 450 feet per minute at 60° F.

So many factors enter into multitubular condensers that a great variety of answers could be given to the last question, but ordinarily a speed of 30 feet per minute can be safely assumed.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, September 10, 1910.

The Brockway-Phillips Gas-Driven Ventilating Fan.—Make per Ton of Coal Carbonized.—Some Figures from the Continent.

One of the most interesting novelties put on the market this season is the Brockway-Phillips gas-driven ventilating fan, an elegant little contrivance that can be placed anywhere and everywhere. It comprises a small hot air engine, driven by a gas burner that consumes less than 2 cubic feet per hour, but carrying a 12-inch diameter fan that goes at the rate of 800 revolutions a minute. It creates a brisk air current, and if fitted with a few colored ribbons that are blown about and thus afford illustration of the air movement, is an attractive item for the showroom window at the town office. Sanitary reformers and health enthusiasts are continually preaching, in season and out of season, the advantages of fresh air, and some of them seem to think that the best way to defy the doctor is to sleep with one's head hanging out of window; but without going to extremes, no one can deny the importance of proper ventilation in our living, working and sleeping rooms. This useful appliance is capable of general utilization, but unfortunately it shares with the incandescent burner the fact that the hourly consumption is very small beer from the gas supplier's point of view. But it is only by utilizing small outlets as well as large that a sound business can be built up, and the aid of the gas-driven fan in this direction is not to be despised. The axis of the fan may be horizontal or inclined at any angle, and the weight of the whole machine is under 12 pounds.

The usual annual meetings of shareholders, for consideration of the reports on the working during the half year ended June 30, 1910, are now for the most part things of the past, and in all cases they exhibit a satisfactory state of affairs, notwithstanding the disadvantages of a mild winter and a general slackness of trade throughout the country. As remarked on previous occasions, the consumption of gas is not affected by bad times to the extent that formerly obtained, showing that it has become more of a necessity than a luxury. I might almost go further and say that the time when expenditure is light is advantageous to the consumption of gas, because, when one is looking about for every means of reducing expenditure, and amongst other things for the cheapest source of light, he is not likely to go far away from the gas incandescent burner. The extraordinary activity evident as regards the introduction of novelties for the coming season is in itself evidence of the position of gas as a lighting agent in the view of the public. Here and there one meets with complaints as to the increased cost of coal, brought about by recent legislation in respect to the working of coal mines, and which appears to have had the effect of increasing the price to the user without yielding advantage to the seller or the miner. Instead of rendering the latter named class more contented, it has been productive of constant dispute and bickering, and the measure is evidently as unpopular with the miner as it is with the public. But a striking feature of the reports is a large increase in the yield per ton of coal carbonized. In some cases the improvement has been as much as 1,000 cubic feet per ton of coal. The sources of this very satisfactory feature are not far to seek. All who have made extended series of working tests with various kinds of coal in the laboratory know that with the ordinary $\frac{1}{10}$ ton experimental apparatus a yield of 12,000 to 13,000 cubic feet per ton of 2,240 pounds is readily obtained. For many years the practical limit, taking the average of the year's working, was considered to be 10,000 cubic feet; 10,500 cubic feet was considered to be unusually good, and anything within 15 per cent. of the laboratory test was pronounced to be the best that could be expected. Any engineer who talked about a make of 11,000 was regarded as an unscrupulous person not troubled by a very searching public gas examiner, who could, therefore, venture to overweight the exhauster compensator without risk of being found out. But there was no getting away from the fact that the laboratory test was legitimate and above trickery, and it is an obvious deduction that the results of the laboratory might be repeated in the retort house. At any rate there is no reason why such should be regarded as impossible. And this is just what has been done, with the result that more than one gas undertaking is now able to claim an average of not less than 12,500 cubic feet per ton over the year's working. The improvement commenced with the introduction of generator and regenerator furnaces, which are now generally used. These afford several incidental advantages apart from the obvious one of higher heats. With the old pattern grate furnaces there was continual fluctuation, and at clinkering times a large quantity of cold air would get into the setting. The retorts were consequently in a more or less unsound condition, and in any case were burned out in 6 or 9 months. With the generator furnace the retorts can be run for more than double that period, can be maintained at an even high temperature, are not injured by rushes of cold air, and are consequently in much better average working condition from first to last. Another incidental advantage is that working under these improved conditions the formation of carbon is greatly reduced, with the result that the periods of standing off for cleaning have been increased from 30 up to 90 days or more. The old-fashioned rough and ready methods for removing the carbon were so injurious to the retort that the first charge after cleaning was always considered to be wasted. It went to fill up the cracks and incidentally to lay a foundation for facilitating a new formation This has given way to the use of the steam injector and other methods that effect the desired result in a few hours without injury to the retort. Following on these advancements is the use of mechanical drawing and charging appliances, enabling heavier charges to be evenly laid. So much for horizontal retorts. Then sloping or inclined retorts have been largely adopted, not to mention verticals that are absolutely closed from exposure to air during the time of charging. This is not an exhaustive list of the improvements incidental to modern retort house operations, but it is sufficient to explain the great increase in working results. Another feature that has assisted towards this end is the increased day and summer consumption. Fifty years ago the ratio between the maximum and the minimum days consumption in the year was more than 1.3, and there would be no output with the name during 12 hours of the summer day. Now the corresponding ratio is less than 1.2, and there is a brisk consumption over 18 hours out of the 24. All the retorts under fire can therefore be maintained in full operation, and it is possible to go through the 12 months without having to resort to the old time expedients of putting a few beds on slow fire, of slacking off, or of missing one or more charges. And with the more even make through the year there is nothing like the amount of letting down and lighting up that was formerly necessary. So the higher

results are due to more favorable conditions of working in addition to the refinements above instanced.

The *Journal of Gas Lighting* for the current week contains statistics of the gas supply of Paris, Hamburg and Zürich, as presented by the official reports for the year 1909. The late appearance of these documents would indicate no undue hurry in their preparation, but rather an official delay that is such a marked feature in regard to English Parliamentary returns. The report of the Company that carries on the supply of Paris in association with the Municipality deals with large figures. The most satisfactory point is that a price for gas that would be almost prohibitory in England does not check the consumption, which has increased 5¼ per cent. as compared with 1908, and exceeds the increase of 4¼ per cent. reported last year. A 10 per cent. increase in 2 years is remarkable at this time of day, when the demand has already been practically saturated. The day consumption increased over 7 per cent. in 1909, and 5¼ per cent. in the previous year, and out of over 15,000 million cubic feet of gas sold in 1909, 6,800 million, or nearly half, is classed as day consumption.

Considering the late hours that are prevalent in the gay French capital, this is a remarkable result. The increase of consumers does not follow quite such a high proportion. At the end of 1909 the books showed 345,000 ordinary and 286,000 on the free fitting system, or a total of 631,000. The average consumption per consumer is 24,000 cubic feet, which is lower than obtains in an average English town. There are no less than 53,644 public lamps, of which 52,400 are on the incandescent system, and there are 1,140 miles of main pipes. Over 500,000 of the consumers occupy flats. The total income for the year is about 104 million francs and the expenditure 80 million francs. Out of this sum it was proposed to pay a dividend of 5¼ per cent. Last year some reference was made to the extensive new works about to be undertaken, at a cost of about 300 million francs, and the arrangements for raising this sum of money have now been completed.

The sales of gas at Hamburg were about 3,440,000 cubic feet and the increased sales, as compared with 1908, happens by a curious coincidence to approximate closely to that above named for Paris. But for the gasholder disaster at the Grasbrook works in December, however, the increase would have been greater. There were 128,215 meters in use at the close of the year, representing an increase of 8¼ per cent. It is noticable that the introduction of the prepayment system appears to be in its infancy, only 1,429 customers being supplied on these terms. The inducements offered are fairly liberal, and include a 5-light meter, a 2-burner cooker, and 3 or 4 pendants or wall brackets with incandescent burners. The ordinary price is about 4s. per 1,000 cubic feet, and that for the slots 4s. 6d., a very moderate loading as compared with the appliances supplied. The consumption per consumer approximates closely to that at Paris, but is greater, being over 26,000 cubic feet. There are 26,333 gas lamps in use, of which 25,750 are fitted on the incandescent system, many of them with 2, 3 or 4 burners, and it is mentioned that there are only about 1,000 lights other than gas used for public lighting. The authorities now find it impracticable to discriminate between the various uses to which gas is applied, but they consider that increased use for cooking and warming is mainly responsible for the growth in consumption as the wide adoption of the sure economical inverted incandescent burner has prevented any increase in the output for lighting.

At Zürich business is also increasing, the sales of gas showing an increase of 6¾ per cent. on the top of a 10¼ per cent. advance in the previous year. The percentage of gas used for lighting shows a slight decrease, which is compensated for by the increase for cooking and heating, and the average consumption per head of the population has increased from 4,686 cubic feet in 1908, to 4,955 in 1909. Like the other two cities named this would not indicate a large average per consumer. There are 6,460 public lamps of which only 50 are on the flat flame system, and 1,550 of them are fitted with automatic lighting and extinguishing apparatus. The mantle renewals during the year average 7¼ per burner. In October last the Corporation supplied *gratis* 4,000,000 cubic feet of gas in connection with a balloon competition.

The agreements between these three towns, situated in different countries and working under different circumstances, are remarkable. In each case there is a large increase of business, for which the cooking and heating is mainly responsible. In two towns at least, practically the whole of the public lights is on the incandescent gas system.

Items of Interest
FROM VARIOUS LOCALITIES.

THE firm of Bacon, Olds & Co. has taken over all the interests heretofore inherent in the firm of Petry & Co., the headquarters of the concern being No. 508 Board of Trade Building, Indianapolis, Ind. In this connection it may be mentioned that Bacon, Olds & Co. have purchased all the interests heretofore controlled by Mr. Ambrose Petry in the New Castle (Ind.) Light, Heat and Power Company, the Three Rivers (Mich.) Gas Company, and the Shelby County (Ind.) Water, Gas and Electric Company. The present owners are rebuilding the electric and water stations at Shelbyville, the entire equipment to be of the latest improved type; besides, considerable work is being done on the gas property. The three fields of this Company's operations should grow rapidly, if indications count for ought. The artificial gas plant in New Castle, Ind., was of entirely new construction last year, gas having been originally turned on the 1st of June. Its sendout now amounts to 2 millions cubic feet per month, and virtually 800 meters and 700 gas ranges are on the lines.

WITH much satisfaction we note that the condition of Mr. Palmer York, Treasurer of the Fitchburg (Mass.) Gas and Electric Company, who had to go under a trying surgical operation some weeks ago, is now at his home in New Haven, Conn, gradually but certainly recovering from the effects thereof.

MR. E. C. WEISGERBER, formerly Secretary and Manager of the properties of the old Zanesville (O.) Gas Light Company, has been appointed Office Manager of the gas property recently acquired in Cedar Rapids, Ia., by the Child-Hulswit Company.

SOME days ago two damage suits in $5,000 each were entered in the Superior Court, Pawtucket, R. I., against the Pawtucket Gas Company, by Kate McGill and Susan M. McCabe, both residents of the premises, 285 Division street. Their averment is that, on August 10, workmen in the employ of the Company entered the cellar to remove a meter, and that so negligently did they perform this work that an escape of gas was caused, which escaping gas subsequently pervaded their apartments in such volume as to inflict them with "great bodily severity."

SECRETARY OF STATE ROSE has issued the necessary license under which the Kankakee (Ills.) Gas and Electric Light Company, and the Citizens Gas Company, of Kankakee, will combine under the corporate title of the Kankakee Gas and Electric Company. The succeeding corporation may also issue capital to the amount of $1,000,000.

AT the annual meeting of the shareholders in the Worcester (Mass.) Gas Light Company, the Directors elected were: Messrs. Chas. D. Lamson, A. G. Bullock, T. B. Eaton, S. B. Woodward, Albert Wood and F. H. Dewey. The reports of the Secretary and Treasurer showed the Company to be in signally prosperous condition. The Directors subsequently perfected the following executive organization: President, C. D. Lamson; Secretary and Treasurer, Jas. P. Hamilton.

THE divisions of superintendent of manufacture and superintendent of distribution, Chattanooga (Tenn.) Gas Company, have been consolidated, and Mr. S. E. De Freese, who has been with the Company since 1895, will hereafter act in the dual capacity. Mr. George Tatum, who has been at the head of the distributing division, returns to England. Mr. R. M. Warden resigned from the place of new business manager, and his successor is Mr. A. C. Gaither, formerly of Louisville, Ky.

SEVERAL prominent business men of Dickinson, N. D., are considering the advisability of there constructing a gas plant.

THE Stacey Manufacturing Company, of Cincinnati, O., recently closed a contract for the building of a complete gas plant at Guadalajara, Mexico, which contract includes a storage holder up to retaining 200,000 cubic feet. The holder, is to be of the 2-lift order and to rest in a steel tank.

MR. HENRY I. LEA, of Chicago, Ills., has been retained by the proprietors of the Brazil (Ind.) Gas Company, to make a study of the local business with a view to making the recommendation of alterations and extensions made necessary by the growth of its business. The plant is of the coal gas type, and Engineer Lea's plans will provide for an ultimate increase in capacity of not far from 200 per cent.

AT the annual meeting of the Welsbach Company, held in Gloucester, N. J., some days ago, the reports showed that the Company had enjoyed a very prosporous twelvemonth, the net profit being returned at $194,051, as against $152,641 for the prior twelvemonth. The usual dividend was declared and the following Directors were re-elected: Messrs. Samuel T. Bodine, Joseph D. Buzby, Thomas Dolan, Sidney Mason, Walton Clark, Randal Morgan, Lewis Lillie and M. L. Arthur.

AT a conference of gas and electric power corporations and the New York up-State Public Service Commissioners, held the second week this month, the matter under consideration was rate schedules. Chairman Stevens, of the Board, said that an enumeration of the schedules filed disclosed the fact that no analogy existed in respect of the schedules, which he declared partook largely of the haphazard style. Vice-President, R. M. Searle, of the Rochester Railway and Light Company, said that equality of rates could only be secured by means of work done through small committees representing the Companies. During the conference a committee was appointed to consider the matter of uniform rates. Chairman Stevens asked the Companies' representatives as to the interpretation of the law, he holding that the charging for electric current by flat rates was entirely in violation of the effective statute prohibiting discriminatory charges. Morris B. Cohn, Jr., of the Buffalo and Niagara Falls Electric Light and Power Company and Cliff Electrical Distributing Company, said that his Company would not like to have any form of schedule adopted which would exclude the flat rate, inasmuch as the Company held a number of contracts on this basis which had many years to run, some of them being effective for 70 years. He believed in the preparation of a form of schedule of rates, but that it should not include any contracts heretofore made, and that any sales of power in excess of 100-horse power should not be required to be filed. The committee to consider a schedule of rates includes J. C. De Long, Syracuse; J. P. Hutchins, Rochester; F. B. H. Paine, Niagara, Lockport and Ontario Power Company; J. T. Cowling, Westchester Lighting Company; A. C. Smith, Cataract Power and Conduit Company; T. R. Beale, Poughkeepsie; and M. W. Offutt, Schenectady.

AT a recent meeting of the Directors of the Malden (Mass.) Gas Light Company it was ordered that the net rates per 1,000 from January 1, 1911, be put at 95 cents; further, that from July next following, the rate shall be fixed at 90 cents.

NO one appeared in opposition at the session of the Public Service Commission, Second New York District, called for the 15th inst., to consider the application of the Municipal Gas Company, of Albany, N. Y., to extend its gas mains to and through the settlement known as Bethlehem. It having been shown that the Town Board of the named place had ruled in favor of granting the necessary preliminary franchise, the Commissioners declared that the work could be undertaken.

THE United Gas Improvement Company has notified Dr. Thomas E. Eldridge, of the Philadelphia Aeronautical Recreation Society, that hereafter the Company would not inflate balloons at its Point Breeze plant. Which notification bears every earmark of common sense.

GAS was turned out from the new gas plant at Ames, Ia., about a fortnight ago. It is quite safe to say that this plant will be reconstructed within a few years, even though the proprietors of the Ames outfit thinks they are wise to inventor Penny's "pressure system."

THE Lowell (Mass.) Company is now screening all the coke that it is selling to the local householders and merchant men. It is graded in 4 sizes, respectively known as: Coarse, broken, medium and fine. The selling price, however, is alike for all gradings, and the figure is $4.75 per chaldron.

MR. T. W. WEBBER, Consulting Engineer of the Child-Hulswit properties, has examined carefully the ground for complaint in connection with the distributing division of the Company's gas plant at La Porte, Ind., and in consonance with his recommendations an overhauling and an extension of the main system will be made. Manager Cook has beyond a doubt done much towards popularizing the use of artificial gas in this quickly expanding Indiana business center.

THE Boston Consolidated Gas Company is arranging a contract under which, provided the Board of Gas and Electric Light Commissioners assents thereto, it will supply gas to the East Boston Gas Company for a term of 3 years, beginning first December next.

A CORRESPONDENT in Tacoma, Wash., writing under date of the 12th inst., incloses the following: "A rule promulgated by a gas company that, in apartment houses or other buildings where a large number of meters must be installed, the company may have a meter room on each floor instead of installing meters in each department, is held to be a reasonable rule by the Supreme Court in handing down a decision in the case of Fred Hallett and others against the Seattle Lighting Company. When Hallett and Martin put up a 3-story apartment house in Seattle they were told to provide for meter rooms to cover the 27 apartments. They refused to obey the Gas Company's rule and went into court. They lost, the trial court holding the rule reasonable. In the meantime the Company has installed a single-meter in the basement, and the Supreme Court says the owners of the building may have an order making this arrangement mandatory."

A SPECIAL meeting of the shareholders of the Massachusetts Lighting Companies will be held the morning of the 29th inst., for the purpose of ordering a stock increase, the proceeds of which issue will be used in financing its recently acquired control in the Gloucester (Mass.) Company.

AT the annual meeting of the Woonsocket (R. I.) Gas Company the officers elected were: Directors, Messrs. R. W. Fitz, F.W. Royce, F. E. Holden, J. W. Ellis, C. E. Ballou and Chas. H. Darling; President, F. E. Holden; Treasurer, H. B. Sawyer, Assistant Treasurer, C. H. Byrne.

MR. J. E. LENNON, shortly before he left Marlboro, Mass., to journey to his new field of duty, was called into the office by Mr. E. F. Goggin, who, in the presence of the office force, presented to Mr. Lennon a handsome travelling bag and a gold handled umbrella, as marks of appreciation from his former subordinates. Mr. Goggin's presentation speech nicely explained that while they regretted his going from them, they nevertheless appreciated the fact that it was promotion which caused him to leave them. Mr. Lennon fittingly responded in words which expressed his appreciation of their loyalty to the Company and their upholding of him in their joint work.

THE Consolidated Gas Purification and Chemical Company has been incorporated in Hoboken, N. J., with a capital of $300,000, by Messrs. H. M. Beadley, W. H. Lindsey and Garrett S. Andrews. As its corporate name implies the Company will manufacture gas purifying material.

THE first meeting of the Board of Directors of the Laclede Gas Light Company, of St. Louis, held since the order making a vacation time was adopted, was held in St. Louis, the 15th inst. A critical examination of the Company's financial standing was had, with the result that it was determined, though the large and expensive betterments now in course of carrying out will absorb a rather heavy sum of money, to maintain the increase of the dividend rate to 7 per cent. The Directors in attendance at the meeting were, Messrs. Charles L. Holman, Murray Carleton, G. H. Walker, James E. Smith, D. R. Calhoun, Alonzo O. Church and Chas. H. Hutty.

MR. H. T. G. NAUMANN, Inspector of Gas for Port Huron, Mich., in his report to the authorities respecting the quality of gas supplied during August, notes that the candle power averaged 18½, that the pressure averaged 3.20 inches, and that the calorific value equalled an average of 683 British thermal units. All of which figures go to show that President Lynn and Manager Sloan are more than making good the promises which eventually induced the Port Huron authorities to grant the Company a suitable extension of its franchise.

SOME days ago the body of Frederick F. Gardner, General Manager of the Shore Electric Company, which supplies electric currents to the New Jersey shore settlements of Red Bank, Rumson and Seabright, was found in some bushes in an unfrequented part of Red Bank, where it had been covered for quite a while—he had been missing since the 23d ult., and discovery was not made until the 9th inst. Examination disclosed a bullet wound in the head, and further investigation showed that his money, watch and scarf pin were still on his person. Deceased was originally connected with the Bergen County Gas and Electric Company, as Manager of its Englewood electric division, during the time that corporation was controlled by Mr. F. B. Poor and associates, and in 1897 took charge of the Shore Electric Company plant. He was a hard worker and a successful one.

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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CHARLES H. WADELTON,
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The Market for Gas Securities.

"Nothing doing," in the slang of the day, rather aptly describes the market for the moment. However, mayhap there is a grain of promise in the quietude, in that no drop in quotations may be written down for the week. Consolidated is 130½ to 131, and the likelihood is that a good rise in its quoted value will soon be made. The people who thought there was no exceeding value in the Company's surplus real holdings in the city were rudely disturbed when the news was printed that the Company had parted with a portion (a small portion at that) of its surplus ots at an upset somewhere between 2½ and 3 millions.

Brooklyn Union is about the strongest thing on the list. The New Haven Company's regular quarterly dividend of 2 per cent. is payable this day week—Friday. The final payment on that Company's new bond issue is payable the 30th.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

SEPTEMBER 26.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	130¾	131
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	8,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,600,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101¼
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98¼	100¼
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	133	133
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	509	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	¾	⅞
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	509,000	1,000	90	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47¾	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	500,000	50	—	85
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	106½	—
Mortgages, 6's	3,600,000	—	89	100
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	3,500,000	—	102	103
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100¼
Detroit Gas Co., 5's	881,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104¾	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113¾
" Bonds, 5's	10,500,000	—	108	108¾
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	100	100¼
Preferred	2,500,000	100	85	86½
Bonds	10,000,000	1,000	102¾	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	106¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	83	83¼
Preferred	25,000,000	100	92	92¼
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	107	107¼
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¼	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	1,600,000	200	383½	385
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	381	—

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New advertising, or changes in standing ads., to assure attention the issue following their reception, must be in hand on Wednesday.

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WATER METERS.

Pittsburg Meter Co., East Pittsburg, Pa. 606

Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

IMPROVED AMMONIA CONCENTRATOR.

About 130 in use. Write to

STROH & OSIUS, Patentees, or

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CONSULTING ENGINEER,

LIGHT, HEAT AND VENTILATION,

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NEW YORK CITY.

WILLIAM A. BAEHR,

CONSULTING ENGINEER,

Peoples Gas Building,

CHICAGO.

Also Representing

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EDWIN E. WITHERBY,

SPECIAL REPRESENTATIVE

GAS MACHINERY COMPANY,

CLEVELAND, O.,

Will advise on commercial engineering subjects and operation of gas and electric properties.

40 WALL STREET, - NEW YORK.

GLENN MARSTON,

NEW YORK CITY.

MUNICIPAL STATISTICS.

Information for New Business and Commercial and Municipal Ownership Campaigns. :: :: :: :: ::

CIVIC AND BUSINESS MEN'S ORGANIZATIONS PERFECTED.

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, Sept. 14, 1910.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1910, to stockholders of record at the close of business, Sept. 30, 1910. Checks will be mailed.

1841-4 LEWIS LILLIE, Treasurer.

WORKING SUPERINTENDENT WITH EXCELLENT RECORD.

The owners of one of the successful gas light companies in Massachusetts want to secure for their working superintendent a position of a somewhat similar character in a gas company. This superintendent has an exceptionally fine record and has outgrown present position. We can give you the history of his advancement during the past 15 years. His habits are absolutely temperate and character of the highest standing.

Address, "SUPERINTENDENT,"

1841-2 Care this Journal.

WANTED,

Position as Superintendent and Manager of Coal Gas Plant Located in city of 10,000 to 20,000.

Twenty years' experience in all departments. Good record and A-No. 1 references.

1841-1 Address, "PRACTICAL," care this Journal.

Position Wanted.

I am seeking a position either of small property or new business manager of large company. Have had 14 years' gas and electric experience. Will be glad to consider any offer. Address,

F. R. HUTCHINSON,
122 South New Hampshire Av., Atlantic City, N. J.

1842-1

Position Wanted.

Superintendent of gas company in Western city of 25,000 desires to change location for personal reasons. Married; strictly temperate. Experienced in both gas and electricity. References if desired.

1837-6 Address, "M. S.," care this Journal.

Position Wanted.

A gas manager now employed desires a charge. City of 15,000 population or over preferred. Has a good, clean record and can produce results. Will work on salary and commission basis if desired.

1842-2 Address, "GAS," care this Journal.

Position Wanted.

Practical man, with 15 years' experience in the manufacture and distribution of coal and water gas, desires position with company in Western State. Competent to take entire charge.

Address, "A. H.,"

1842-2 Care this Journal.

WANTED,

Experienced Salesman to Develop Industrial Gas Appliances.

Must be thoroughly familiar with heating, melting, brazing processes, gas engines, etc. State experience, references, and salary expected. Address,

HAVERHILL GAS LIGHT COMPANY,
1842-1 Haverhill, Mass.

WANTED,

By a Progressive New England Gas Company, a Young Man as Office Assistant.

One acquainted with modern methods required. Address, stating age and experience,

1841-3 "M. N.," care this Journal.

WANTED,

Working Foreman for Gas Works.

One who understands benches, laying mains and services. Must be sober.

Address, "FOREMAN,"

1841-2 Care this Journal.

Gasfitter Wanted.

Steady work the year round for young man who can do gasfitting, take care of gas arcs, read meters, etc. Address,

SAULT STE. MARIE GAS AND ELECTRIC CO.,
1841-2 Sault Ste. Marie, Mich.

WANTED,

Gas or Gas and Electric Property,

In city of 10,000 or more. Give full particulars in first letter. Price must be reasonable.

Address, "INVESTMENT,"

1842-4 CARE THIS JOURNAL.

WANTED,

An Assistant to the Manager of a Water Gas Company in a Town of 10,000.

Party must have fair knowledge of making water gas and running mains, selling and installing lights and all appliances. Opportunity for young man to equip himself for management of gas property. State salary desired. Address,

1842-tf "WILLING TO WORK," care this Journal.

FOR SALE,

INGERSOLL-SARGEANT GAS COMPRESSORS.

One Duplex, capacity about 100,000 cubic feet per hour. Steam cylinders 18 inches by 24 inches; gas cylinders, 24¼ inches by 24 inches.

One Duplex, Cross Compound, capacity about 150,000 cubic feet per hour. Steam cylinders 23 inches and 34 inches by 24 inches; gas cylinders 28¼ inches by 24 inches.

In first-class condition. For particulars and full description apply to

"COMPRESSOR,"

1842-4 Care this Journal.

FOR SALE.

Tenders will be received for the following second-hand benchwork, up to October 30th:

Arches, 7 feet 6 inches; retorts, 14 inches by 26 inches—McIlhenny lids; need grate and bearing bars. The equipment of about 20 free-firing benches of 6's; furnaces, 12 inches to 14 inches and 28 inches deep. Mains, etc., old style. Bridge pipes, with plugs, old style. The iron in these is in good condition. For particulars, address,

L. J. MONTGOMERY,
1836-tf 150 Nassau street, New York City.

The Light, Heat & Power Corporation, Boston

CONTRACTING ENGINEER

Electric Light and High Pressure Gas Plants. Equipment, Material and Supplies.

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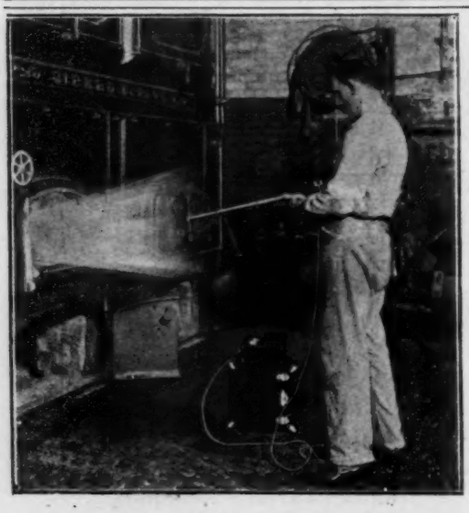
Cable Address, "LIHEPOWCO." Code, LIEBERS'.



BROWN ELECTRIC PYROMETERS

For all ranges of temperature. Particularly advantageous to Progressive Gas Works. :: :: :: ::

THE BROWN INSTRUMENT COMPANY,

315 Walnut St., Philadelphia. Pa.

BRANCHES, - PITTSBURGH, CHICAGO.

Made in 3 and 4 Burners.

AMERICAN 1910-A

INVERTED GAS ARC LAMP.

YOU WHO ARE LOOKING FOR GOOD THINGS NOTE SOME OF THE EXCEPTIONAL FEATURES OF THIS LAMP.

The Ventilator is made in two vertical hinged sections which may be easily opened, removed if desired, and locked automatically.

The Valve may be removed for cleaning by loosening ONE set screw and turning a hexagon nut. No Springs to get out of order.

All working parts accessible, removable and interchangeable, even while lamp is in operation.

Each Burner has a Separate Gas Adjustment which may be locked after correct incandescence is obtained.

Mantles are suspended in a Plate which raises and lowers on two guide rods—No Jar—No Warping—Great Saving in Maintenance Costs.

Porcelain Burner Noses are held firmly in position by German Silver Cap.

Best Material. Skilled Workmanship. Every Lamp guaranteed mechanically perfect.

A LABOR SAVER. A LIGHT GIVER. A PRICE SATISFIER.

CORRESPONDENCE SOLICITED.

AMERICAN GAS LIGHT COMPANY,

KALAMAZOO, MICH. BOSTON, MASS. MANCHESTER, ENGLAND.

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October, 1910. New York City. Officers: President, Wm. H. Bradley, N. Y., City Secretary, A. B. Beadle, 29 West 39th street, N. Y. City.

Canadian Gas Association.—Annual meeting, June, 1911. ————. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, Nov., 1910. New York City. Officers: President, C. R. Huntley, Buffalo, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street, New York City.

Guild of Gas Managers of New England.—Annual meeting, December. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, A. K. Quinn; Newport, R. I.; Secretary, Walter G. Africa, Manchester, N. H.

Illinois Gas Association.—Annual meeting, time, March, Chicago, Ills. Officers: President, A. S. Harrington, Chicago, Ill.; Secretary-Treasurer, C. B. Strohn, Elgin, Ill.

Illuminating Engineering Society.—Annual meeting, Baltimore, Md., Oct. 1911. Meetings of Sections, monthly. President, W. H. Gartley, Philadelphia, Pa.; Secretary, Preston S Millar, 29 W. 39th street, N. Y. City. Sections: New York: Secretary, Albert J. Marshall, 227 Fulton street. New England, Secretary, L. D. Gibbs 39 Boylston street, Boston, Mass. Philadelphia, Secretary, F. N. Morton, Broad and Arch streets Chicago, Secretary, T. R. Beebe, 157 Michigan avenue,

Indiana Gas Association.—Annual meeting, January 19, 1911, Fort Wayne, Ind. Officers: President, Carl H. Graf, Indianapolis; Vice-President, S. E. Mulholland; Secretary-Treasurer, Philmer Eves, Indianapolis Gas Company, Indianapolis, Ind.

Iowa District Gas Association.—Annual meeting, time, June, 1911, ————. Officers: President, Austin Burt, Waterloo, Ia.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, ———— Wichita, Kas. Officers: President, W. A. Scothorn, Hutchinson, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association.—Annual meeting, time, Sept. 1911; Battle Creek. Officers: President, A. P. Ewing, Detroit, Mich.; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April 13, 14 and 15, 1911; St. Louis, Mo. Officers: President, R. J. Irvine; Secretary and Treasurer, W. J. Cunningham, Springfield, Mo.

National Commercial Gas Association.—Annual meeting, December, 1910: Boston. Officers: President, E. N. Wrightington, Boston; Secretary, Louis Stotz, 36 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May 16, 17 and 18, 1911; Pittsburgh, Pa. Officers: President, John M. Garard, Columbus, O, Secretary, T. C. Jones, Delaware, O. Editor Wrinkle Department, F. W. Stone, Ashtabula, O.

New England Gas Association.—Annual meeting, third Wednesday in February; Boston. Officers: President, W. H. Snow, Holyoke, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

Oklahoma Public Utilities Association.—Annual meeting, May 9, 10 and 11, 1911. Officers: President, E. C. Reynolds; Secretary, Galen Crow, Guthrie, Okla.

Pacific Coast Gas Association.—Annual meeting, Sept. 20, 21 and 22, 1910, Los Angeles, Cal. Officers: President, W. B. Cline, Los Angeles, Cal.; Secretary-Treasurer, John A. Britton, 925 Franklin street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, April, 1911, Reading, Pa. Officers: President, J. H. Keppelman, Reading, Pa.; Secretary-Treasurer, William H. Merritt, Lebanon, Pa.

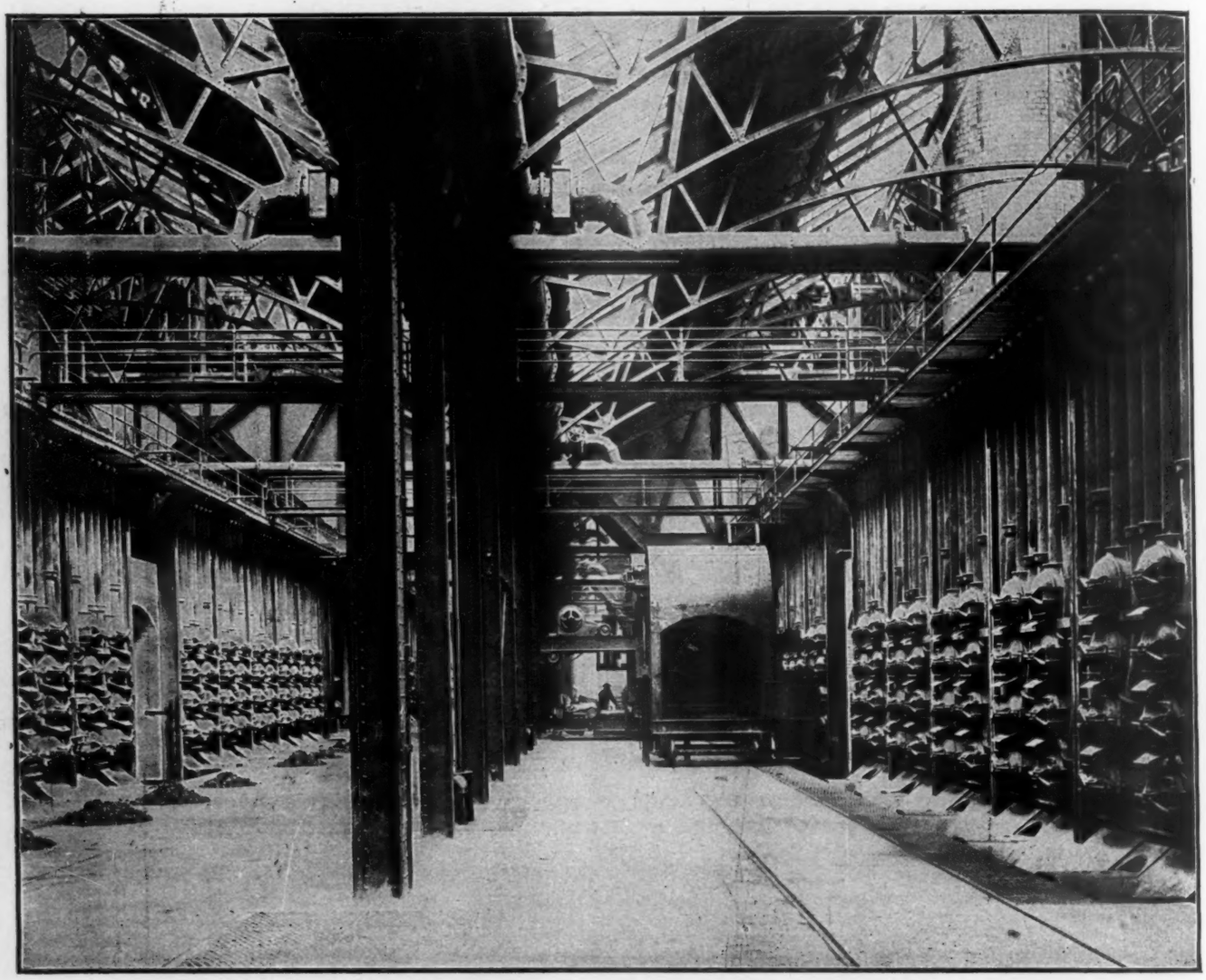
Society of Gas Lighting.—Annual meeting, December, 1910; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 1123 Broadway, New York.

Southern Gas Association.—Annual meeting, April 19-21, 1191, Montgomery, Ala. Officers: President, H. W. Frund, Salisbury, N. C.; Secretary-Treasurer, Jas. Ferrier, Rome, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. May, 1911, ———— Tex. Officers: President, W. B. Tuttle, San Antonio, Tex.; Secretary, H. B. Head, Stephensville, Tex.

Wisconsin Gas Association.—Annual meeting, May ————, 1911, Milwaukee, Wis Officers: President, W. H. Winslow, Superior, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.

Directory of American Gas Companies, 1909. Price, $5.00. For Sale by A. M. Callender & Co., 42 Pine St., N. Y.



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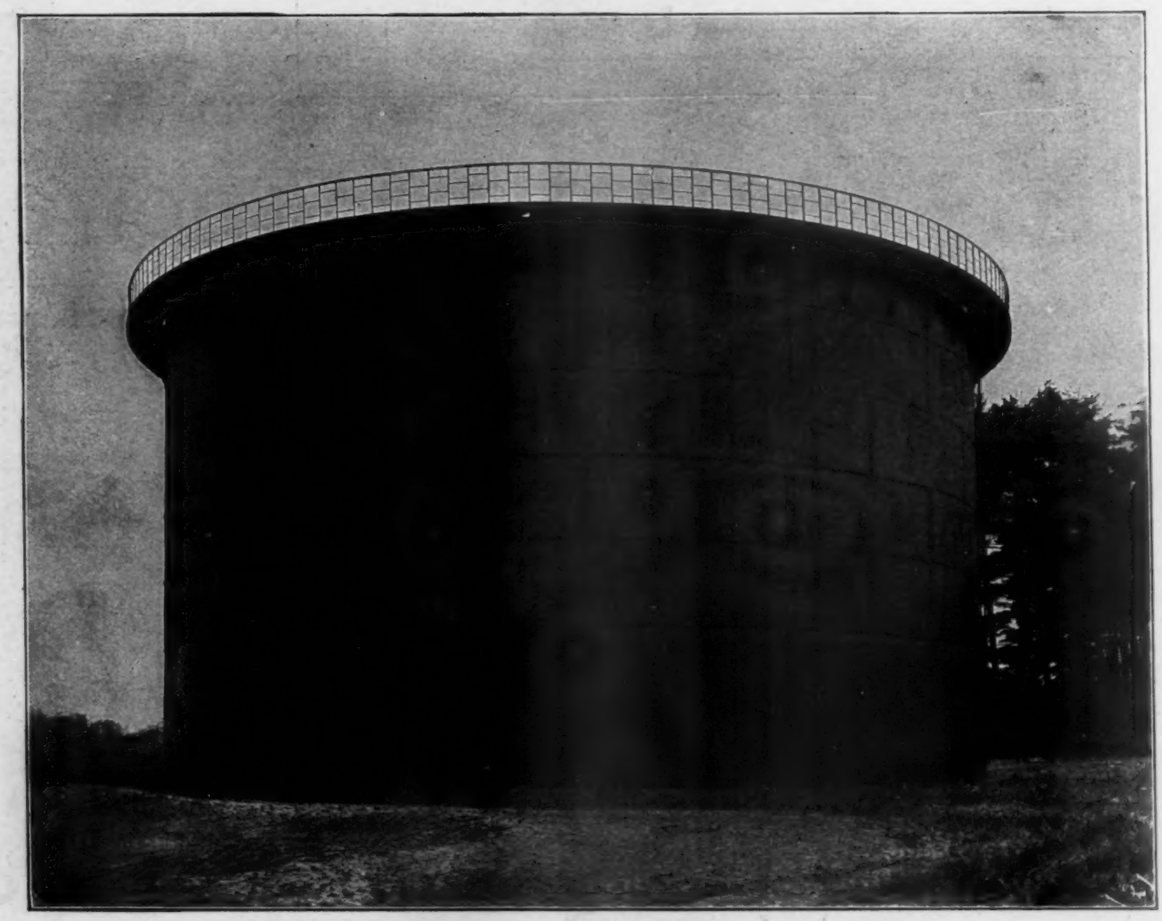

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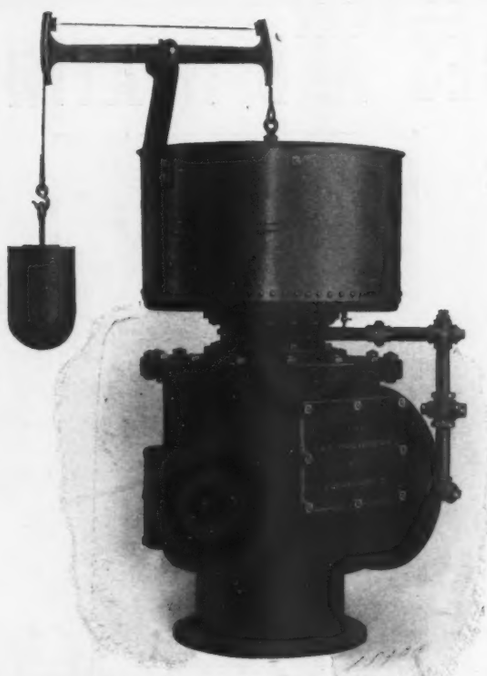

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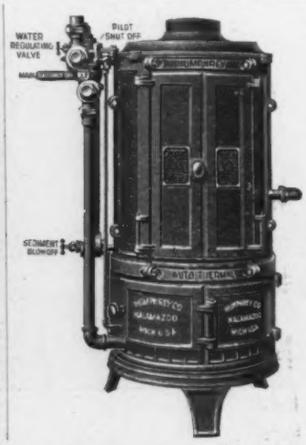

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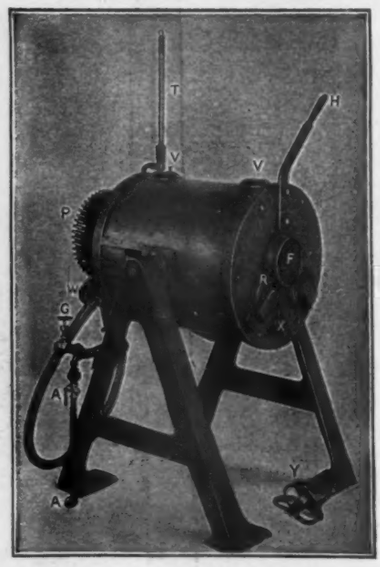

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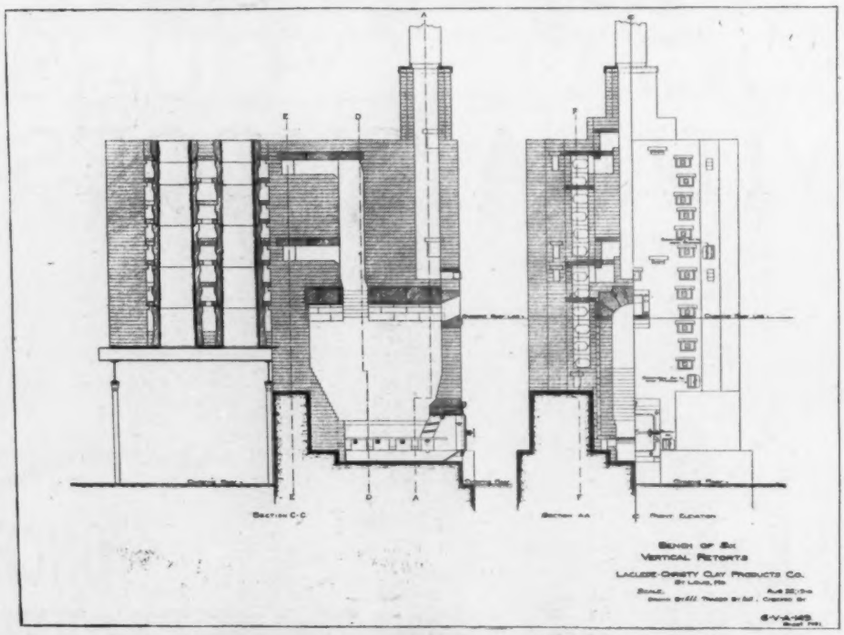

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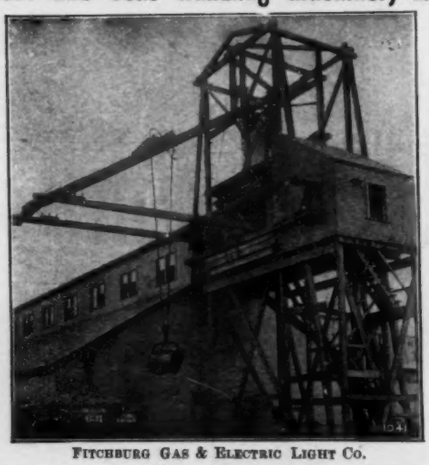

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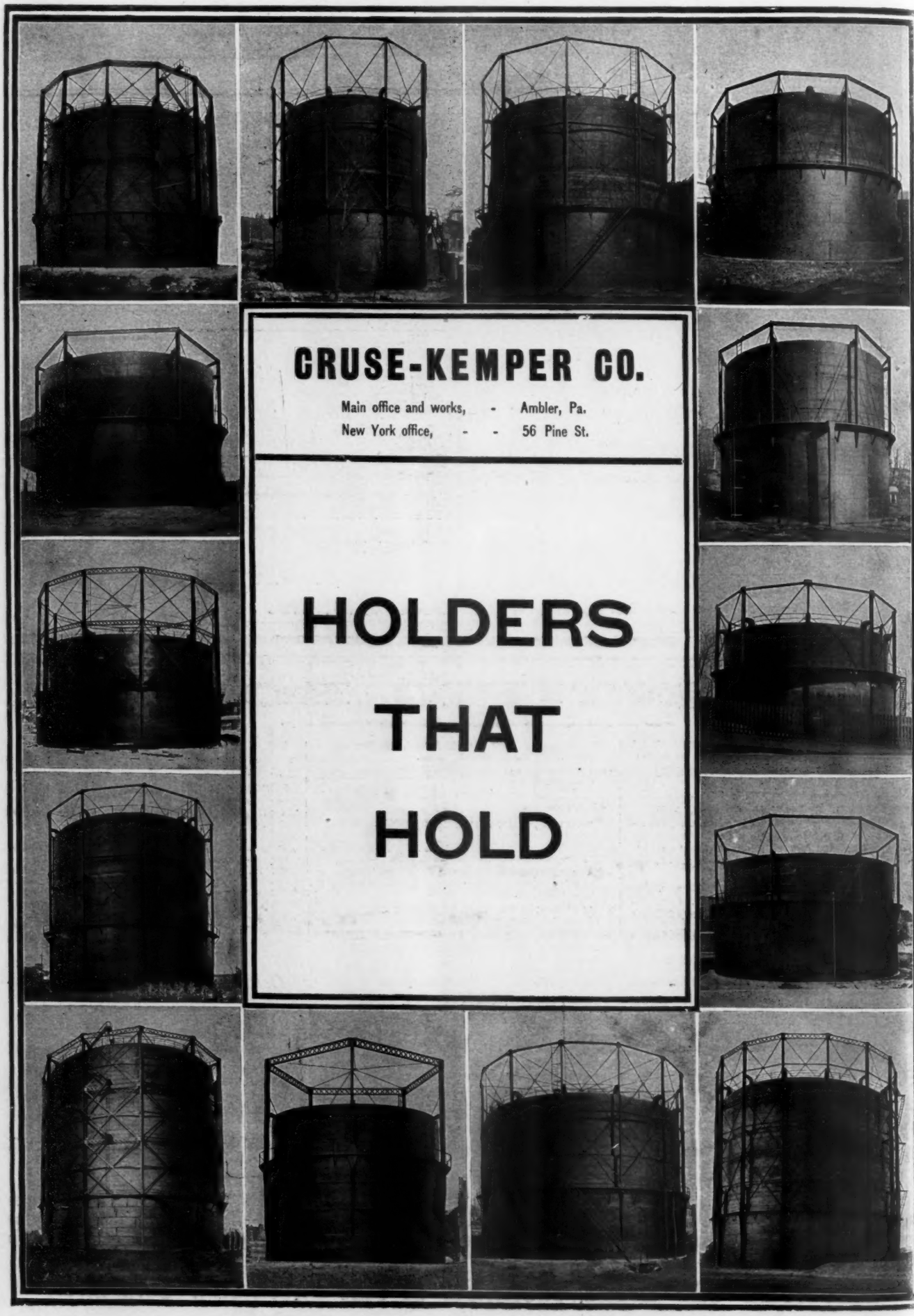
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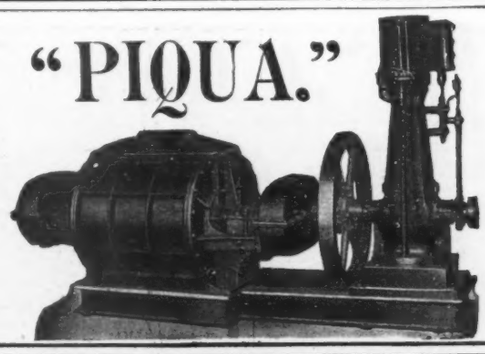

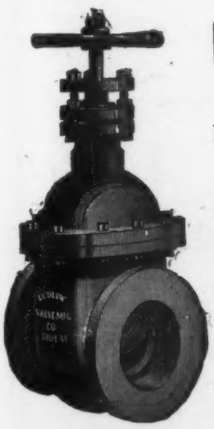

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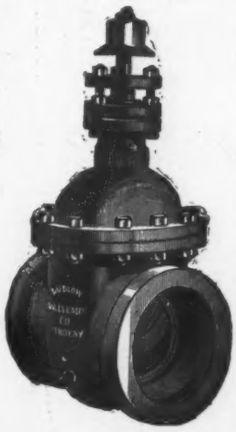

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[COMMUNICATED BY THE AMERICAN METER COMPANY.]

Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.	Day of Week.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Date.	Complete Lighting in 1 Hour. From Time Given.	Complete Extinguishing in 50 Minutes. From Time Given.
		P.M.				P.M.	A.M.
Sat.	1	6.20	4.50 A.M.	Sat.	1	5.22	4.42
Sun.	2	6.10 N.M.	5.00	Sun.	2	5.22	4.42
Mon.	3	6.10	5.00	Mon.	3	5.22	4.42
Tue.	4	6 10	5.00	Tue.	4	5.22	4.42
Wed.	5	6.10	5.00	Wed.	5	5.22	4.42
Thu.	6	6.10	5.00	Thu.	6	5.22	4.42
Fri.	7	6.50	5.00	Fri.	7	5.22	4.42
Sat.	8	7.20	5.00	Sat.	8	5.12	4.52
Sun.	9	8.10	5.10	Sun.	9	5.12	4.52
Mon.	10	9.00	5.10	Mon.	10	5.12	4.52
Tue.	11	9.50 F.Q.	5.10	Tue.	11	5.12	4.52
Wed.	12	11.00 A.M.	5.10	Wed.	12	5.12	4.52
Thu.	13	12.10	5.10	Thu.	13	5.07	4.52
Fri.	14	1.20	5.10	Fri.	14	5.07	4.52
Sat.	15	2.30	5.10	Sat.	15	4.57	5.02
Sun.	16	3.50	5.10	Sun.	16	4.57	5.02
Mon.	17	No L.	No L.	Mon.	17	4.57	5.02
Tue.	18	No L. F.M.	No L.	Tue.	18	4.57	5.02
Wed.	19	No L.	No L.	Wed.	19	4.57	5.02
Thu.	20	5.40 P.M.	7.40 P.M.	Thu.	20	4.57	5.02
Fri.	21	5.40	8.30	Fri.	21	4.57	5.02
Sat.	22	5.40	9.20	Sat.	22	4 47	5.07
Sun.	23	5.40	10.20	Sun.	23	4.47	5.07
Mon.	24	5.40 L.Q.	11.30	Mon.	24	4.47	5.07
Tue.	25	5.40	12.40 A.M.	Tue.	25	4.47	5.07
Wed.	26	5.40	1.40	Wed.	26	4.47	5.07
Thu.	27	5.40	2.50	hu.T	27	4.47	5.07
Fri.	28	5.40	3.50	Fri.	28	4.47	5.07
Sat.	29	5.40	5.30	Sat.	29	4.37	5.17
Sun.	30	5.30	5.30	Sun.	30	4.37	5.17
Mon.	31	5.30	5.30	Mon.	31	4.37	5.17

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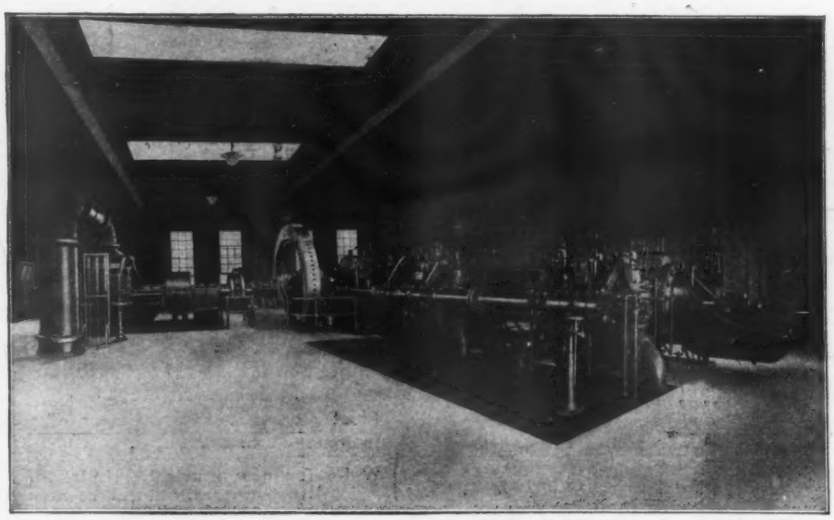

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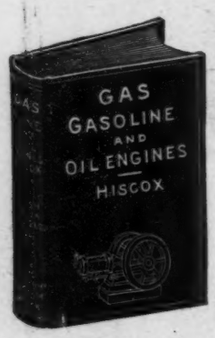

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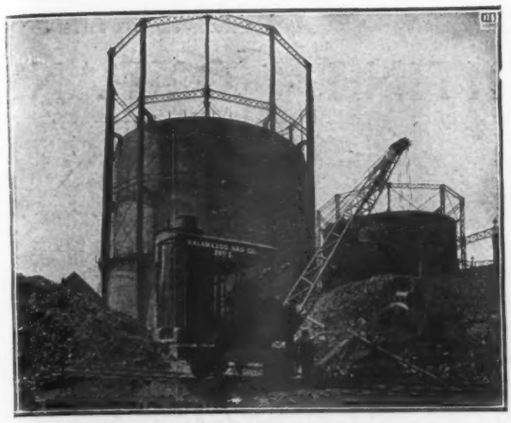

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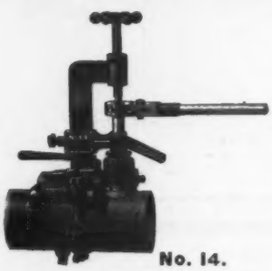
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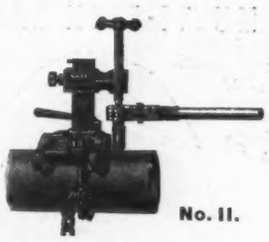
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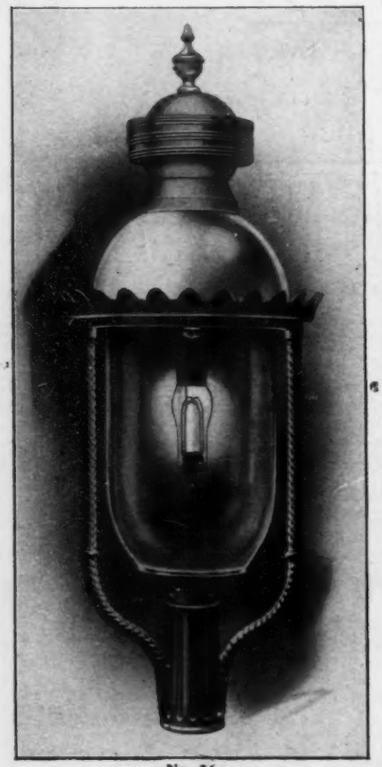

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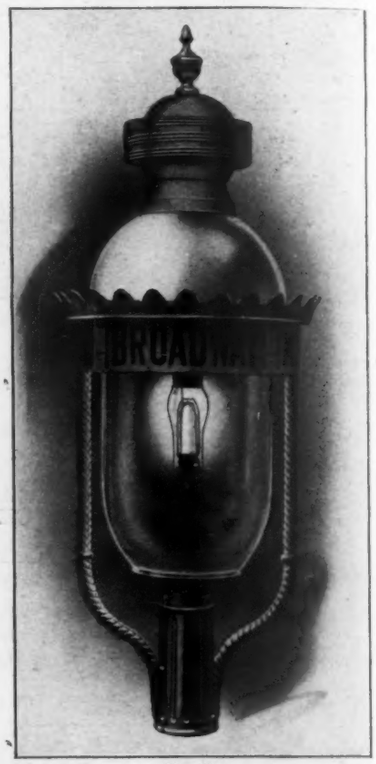

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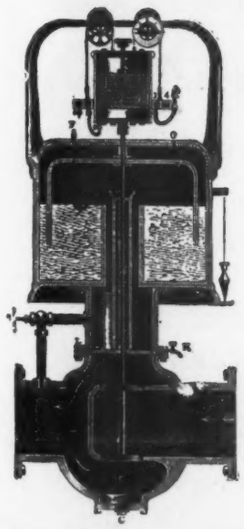

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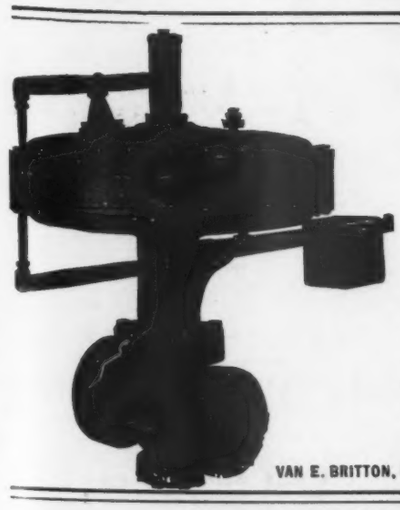

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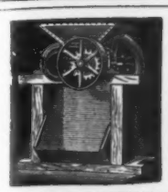

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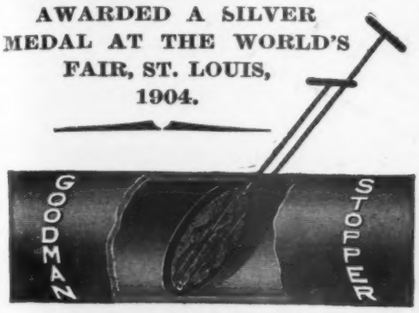

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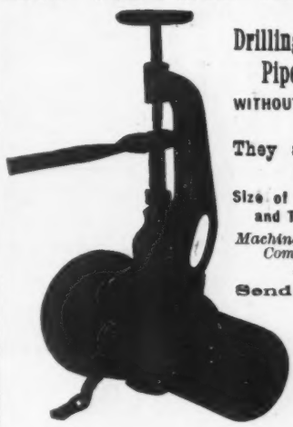

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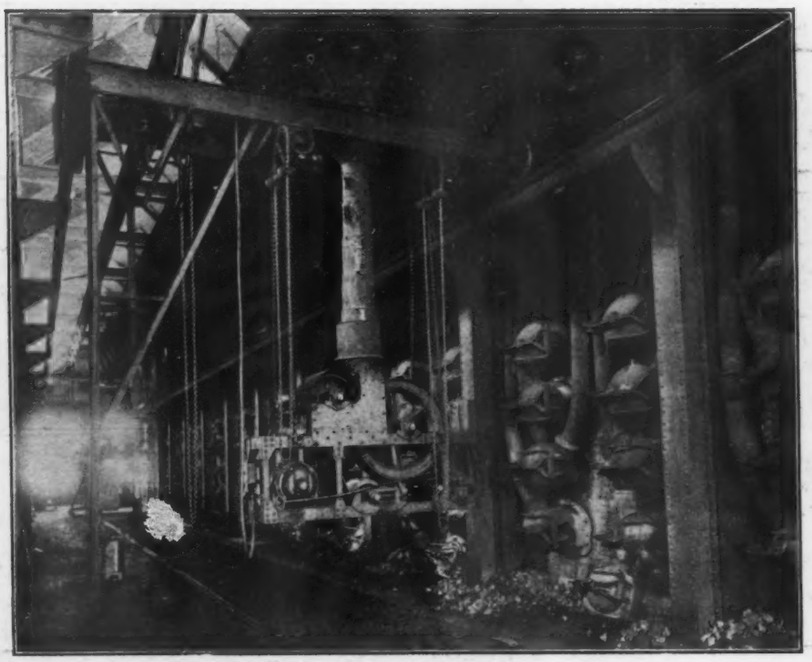

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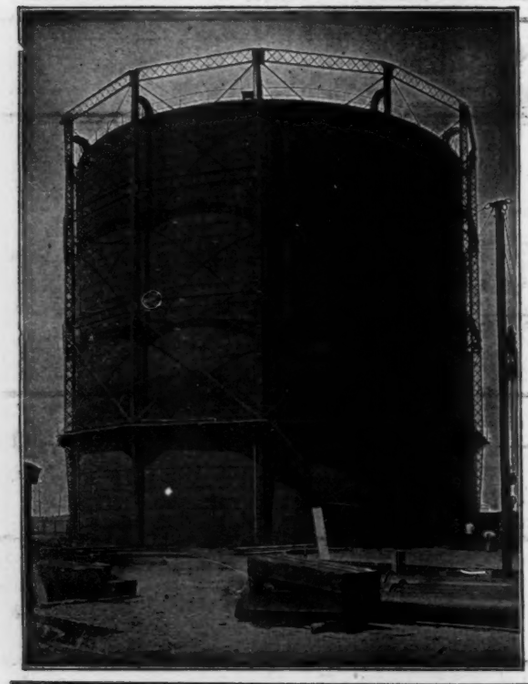

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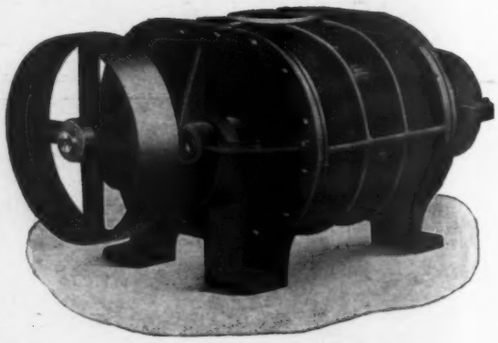

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